COMMONWEALTH of VIRGINIA

Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the

James River, Lynnhaven and Poquoson Coastal Basins

Public Comment Draft

April 2004

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I. Introduction and Background

This ***Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the James River, Lynnhaven and Poquoson Coastal Basins*** reflects a continuation of Virginia's commitment to improving local water quality and the water quality and living resources of the Chesapeake Bay. With its roots in the 1983 creation of the Chesapeake Bay Program the strategy builds on previous efforts and looks to shape actions in a large and diverse watershed over the next six years and beyond. The reduction goals are far greater than any set before.

Developed as a partnership between natural resources agencies and local stakeholders, this strategy provides options for meeting ambitious reductions in nitrogen, phosphorus and sediment and outlines future actions and processes needed to maintain these levels in the face of a growing population and changing landscape.

The James is the largest of the state's Chesapeake Bay watersheds, stretching from the West Virginia line to the river's mouth in Hampton Roads. The challenges in developing a strategy for such a diverse watershed, and nearby coastal basins, were many.

This nation was born on the banks of the James River. But, it is also a distinctly Virginia river. It runs 340 miles through the heart of Virginia from the Allegheny Mountains to the Chesapeake Bay. It is the nation's longest river to be contained in a single state. The mountain streams, Piedmont creeks and tidal marshes share the watershed with mountain villages, rolling pastures and broad expanses of croplands. It also is home to several of the state's largest cities including Lynchburg, Charlottesville, Richmond and the cities of Hampton Roads. In addition to the James River watershed this strategy also covers the adjoining Poquoson, Back River, Little Creek, and Lynnhaven coastal basins.

A successful nutrient and sediment reduction strategy will have significant impacts on water quality in the creeks, streams and rivers that feed the James and nearby coastal embayments. Likewise, along with strategies being developed for other Bay tributaries in Virginia, Maryland, Pennsylvania, West Virginia, New York and Delaware, they will have a cumulative effect on the waters and living resources of the Chesapeake Bay.

The Bay is North America's largest and most biologically diverse estuary, home to more than 3,600 species of plants, fish and animals. Approximately 348 species of finfish, 173 species of shellfish and more than 2,700 species of plants live in or near the Bay. It also provides food and shelter for 29 species of waterfowl, and more than one million waterfowl winter annually in the basin.

The plight and status of these species show that they will respond to the proper management practices. And, that much still needs to be done.

A history of restoration

In the early 1980s, the Chesapeake Bay was a resource in severe decline. Water quality degradation played a key role in the decline of living resources in Bay and its tidal tributaries.

In 1983 the governors of Virginia, Maryland and Pennsylvania were joined by the mayor of Washington, D.C., the U.S. EPA administrator and the chairman of the tri-state legislative Chesapeake Bay Commission to sign an agreement working toward the restoration of the Chesapeake Bay. This agreement created a multi-jurisdictional, cooperative partnership known as the Chesapeake Bay Program. The program sought to restore the Bay and its resources through shared, cooperative actions.

An over-abundance of nutrients was identified as the most damaging water quality problem facing the Bay and its tributaries. High levels of nutrients, primarily phosphorus and nitrogen, overfertilize the Bay waters, causing excess levels of algae. These algae can have a direct impact on submerged aquatic vegetation by blocking light from reaching these plants. More importantly, these algae have an indirect effect on levels of dissolved oxygen in the water. As algae die off and drop to the bottom, the resulting process of biological decay robs the surrounding bottom waters of oxygen, needed by oysters, fish, crabs and other aquatic animals.

The 1987 Bay Agreement recognized the role nutrients played in the Bay's problems and committed to reducing annual nitrogen and phosphorus loads into Bay waters by 40 percent by 2000. It was estimated that a 40 percent reduction would substantially improve the problem of low dissolved oxygen, which affects the Bay and many of its tributaries.

Nutrient reduction tributary strategies initiated

In 1992, Virginia joined her Chesapeake Bay Program partners in determining that the most effective means of reaching that water quality goal would be to develop tributary-specific strategies in each Chesapeake Bay river basin.

The tributary strategy approach is born of the realization that our actions on the land have a major impact on the waters into which they drain. This is particularly true in the 64,000 square mile Chesapeake Bay watershed, where the ratio of land to water area is 14:1. This approach also allowed stakeholders in each basin to address its mix of pollutants from point sources (i.e. wastewater treatment plants and industrial outflows) and nonpoint sources (runoff from farms, parking lots, streets, lawns, etc.).

Late in 1996 Virginia released its first tributary strategy, the ***Shenandoah and Potomac River Basins Tributary Nutrient Reduction Strategy***. The result of more than three years of work, the strategy was developed cooperatively with local officials, farmers, wastewater treatment plant operators and other representatives of point sources and nonpoint sources of nutrients in the basin. As a result of the strong support for this grass-roots approach, the 1997 Virginia General Assembly adopted the Water Quality Improvement Act to provide cost-share funding for implementation of tributary strategies.

The ***James River Basin Tributary Nutrient and Sediment Reduction Strategy,*** released in July, 1998, provided information on water quality, habitat, and living resources conditions in the James River, summarized actions taken to date for reducing pollutants, and provided an overview of additional management actions that could further restore the health and productivity of the river. However, this initial strategy did not set forth specific restoration goals, as Chesapeake Bay Water Quality Model data was not yet available. Bay Model results became available toward the end of 1998.

In response to that availability representatives from wastewater treatment plants, soil and water conservation districts, private environmental groups, industry, local government, and other stakeholders representing point sources and nonpoint sources of nutrients in the basin (known as the James River Technical Review Committee or TRC) worked collectively to develop goals for the reduction of nutrients and sediment in the James watershed. The focus of this round of strategy development was restoration in the James River itself, since monitoring and modeling work done to that point indicated that nutrient and sediment loads from the James had relatively little impact on water quality conditions in the mainstem Chesapeake Bay.

After several attempts, the James TRC was unable to reach consensus on nutrient and sediment goals for the basin. Therefore, state agency staff created goal recommendations based on output from the Chesapeake Bay Water Quality Model, which were outlined in the August 2000 follow-up report entitled ***Goals for Nutrient and Sediment Reduction in the James River.*** Those goals, as listed in the 2000 "Goals" report are as follows:

- For sediment loads, achieve a nine percent reduction from the levels that existed in 1985 for the entire basin by the year 2010.
- For all areas draining directly to the tidal fresh portions of the James, Biological Nutrient Removal (BNR) implementation at point sources and an equivalent reduction in nonpoint sources by 2010. This would result in a 32 percent nitrogen and 39 percent phosphorous reduction, based on model simulation, in loading to the tidal fresh region from levels that existed in 1985.
- The net nutrient loadings to the lower estuary from all areas should not be allowed to increase and should be capped at 1996 levels. Growth in load coming from areas directly adjacent to the lower estuary should not exceed the reduced load coming from the tidal fresh portion of the river. The resulting zero net increase in loading to the lower estuary would prevent any degradation relative to current water quality conditions.

Chesapeake 2000, A Watershed Partnership

While progress was being made in removing nutrients from the waters throughout the Chesapeake Bay watershed as the result of tributary strategies, nutrient enrichment remained a problem in the Bay's tidal waters. Beginning in 1998, the U.S. Environmental Protection Agency proposed implementation of a TMDL (Total Maximum Daily Load) regulatory program under Section 303 (d) of the Clean Water Act to address nutrient-related problems in much of Virginia's Chesapeake Bay and tidal tributaries. In May 1999, EPA included most of Virginia's portion of the Bay and several tidal tributaries on the federal list of impaired waters based on failure to meet standards for dissolved oxygen and aquatic life use attainment.

In June 2000, members of the Chesapeake Executive Council signed a new comprehensive Bay Agreement. ***Chesapeake 2000, A Watershed*** **Partnership** is seen as the most aggressive and comprehensive Bay agreement to date. Designed to guide the next decade of Bay watershed restoration**,** ***Chesapeake 2000*** commits to "achieve and maintain the water quality necessary to support the aquatic living resources of the Bay and its tributaries and to protect human health." Meeting this commitment through a continuation of the Bay Program's voluntary, cooperative approach also alleviates the need for regulations to meet the same standards.

The new Bay agreement set out a process for achieving its water quality commitments that included setting increased nutrient reduction goals and the first Bay wide sediment reduction goals.

A living resources approach

This cooperative effort has resulted in nutrient reduction goals that are much more protective than those agreed to in the past. Bay Program partners have agreed to base their success on the attainment of water quality standards, not simply pollution load reductions. These standards strive to meet established criteria for the Bay's designated uses. Bay partners chose designated uses based on living resources' habitat needs – shallow water, open water, deep water, deep channel and migratory and spawning areas.

For the first time, partners developed criteria that take into account the varying needs of different plants and animals and the various conditions found throughout the Bay. The criteria are:

- **Water clarity** – which ensures that enough sunlight reaches underwater bay grasses that grow on the bottom in most shallow areas.
- **Dissolved oxygen** – which ensures that enough oxygen is available at the right time during the right part of the year, to support aquatic life, including fish larvae and adult species.
- **Chlorophyll *a*** – the pigment contained in algae and other plants that enables photosynthesis. Optimal levels reduce harmful algae blooms and promote algae beneficial to the Bay's food chain.

In addition to being the focus for the reduction goals, or "allocations", for tributary strategies, these criteria will serve as the basis for revising water quality standards for Virginia's tidal waters. This regulatory action is taking place simultaneously to the tributary strategy process. A notice of intended regulatory action (NOIRA), the first step in the regulatory process to amend water quality standards, was published in the Virginia Register on November 17, 2003. The Department of Environmental Quality is using a participatory approach to more fully involve the public to develop the new/revised tidal water quality standards. A Technical Advisory Committee of interested stakeholders has been formed and is meeting monthly. A set of draft water quality standards is expected for presentation to the State Water Control Board early this summer, with a request to release them to the public for review and comment. Final state adoption of the standards is scheduled by the end of 2005, to become effective in early 2006, after approval by the U. S. Environmental Protection Agency. More information on this process can be found at **http://www.deq.state.va.us/wqs/pdf/NOIRABay.pdf**

Using computer models to determine allocations

To determine optimal nutrient and sediment allocations, Bay watershed partners developed several simulations for analysis by the Chesapeake Bay Watershed and Water Quality models. Each simulation, or scenario, allows Bay scientists to predict changes within the Bay ecosystem due to proposed management actions taking place throughout the Bay's 64,000 square-mile watershed.

Information is entered into the Watershed Model, which details likely results of proposed management actions. These actions range from improving wastewater treatment technology to reducing fertilizer or manure application on agricultural lands to implementing sound land use programs to planting streamside forest buffers.

Next, these results are run through the Bay Water Quality Model, which makes more than a trillion calculations and provides Bay scientists with a visualization of future Bay and river water quality conditions resulting from each scenario. Throughout the development of the new Bay water quality criteria, more than 70 Water Quality Model runs were conducted, each taking more than a week to complete.

As described above, the Chesapeake Bay Watershed and Water Quality models are powerful tools that help guide the level of effort and the types of actions needed to restore the health of the Bay and its tributaries. Understanding the strengths and limitations of these models is critical to efficiently and effectively targeting implementation efforts.

Estimating existing and future nitrogen and phosphorus loads is a key application of the watershed model. Incorporating good data and monitoring information, this model is well suited to provide these estimates.

Due, in part, to data limitations, sediment transport is simplified and sediment loads from eroding stream banks are not well captured. These limitations need to be addressed in future model versions. Moreover, these limitations need to be considered in determining ongoing implementation priorities. For example, storm water retrofits and stream restoration efforts may be more effective than is currently indicated by the model.

Regardless of certain limitations, the Chesapeake Bay Watershed and Water Quality models provide a good basis for making basing restoration decisions. Moreover, these models compliment and support other tools such as water quality assessment and watershed planning activities.
At the agreed to allocations, the model predicts that we will see a Bay similar to that in the 1950s. Proposed water quality standards will be met in 96 percent of the Bay at all times, and the remaining 4 percent would fall shy of fully meeting the proposed standards for only four months a year.

The resulting nutrient goals (allocations) call for Bay watershed states to reduce the amount of nitrogen entering the Bay and its tidal tributaries from the current 285 million pounds to no more than 175 million pounds per year, and phosphorus from 19.1 million pounds to no more than 12.8 million pounds per year. When coordinated nutrient reduction efforts began in 1985, 338 million pounds of nitrogen and 27.1 million pounds of phosphorus entered the Bay annually.

When achieved, the new allocations will reduce annual nitrogen loads by 110 million pounds and phosphorus by 6.3 million pounds from 2000 levels and will provide the water quality necessary for the Bay's plants and animals to thrive.

The Virginia tributary strategy approach

Using the modeling process described, Bay Program partners then determined specific allocations for each major basin. Allocations for basins that cover more than one state were divided by jurisdiction.

The new nitrogen allocation for the James River strategy is 26.4 million pounds per year, a 29 percent reduction from the load of 37.26 million pounds in 2002. The allocation for phosphorus is 3.41 million pounds compared with an estimated load of 5.95 million pounds in 2002, a 43 percent reduction. The sediment allocation is 930,000 tons per year, compared with 1.17 million tons in 2002, a 21 percent reduction. This sediment allocation does not include loads from shoreline erosion in the tidal region of the river basin.

To reach these ambitious new reduction goals, the current tributary strategy must build on what has gone before, in particular the 1998 strategy and 2000 goals documents for the James River basin. Many of the stakeholder groups involved in developing the previous strategy were active in working with state natural resource agency staff in crafting this nutrient and sediment reduction plan.

The strategy looks at the agricultural nonpoint source practices and wastewater treatment plant reductions that were critical to the 2000 plan to see where practices could be increased. This strategy also looks more closely at measures involving land use, urban nutrient management and stormwater management that will need to play key roles in meeting the new basin allocations.

This strategy identifies a number of nonpoint source best management practices and point source treatment levels that can be implemented to meet the James' allocations. However, the strategy also recognizes the need for reduction efforts to grow and expand in order to meet the 2010 goal and to maintain or cap the allocation once it is achieved. In short, implementation plans that improve local water quality throughout the Chesapeake Bay basins will be a continuous process into the future.

In this regard the strategy outlines processes that need to be developed in order to facilitate implementation between now, 2010, and beyond. There will be annual progress updates and a more thorough, Bay-wide evaluation of advancement towards the 2010 goals when an updated version of the Watershed Model becomes available, which is expected in 2006.

Implementation planning as outlined in this strategy will be continually refined, addressing both point and nonpoint sources. It must identify roles and responsibilities for federal, state and local governments, the private sector, nonprofits and the average citizen. The strategy addresses the need to establish timeframes and make cost estimates and identify potential funding sources.

Tributary strategy implementation will be a continuing process bringing greater consideration of water quality issues to many sectors in each community as time goes by. Recognizing how land use and lifestyle can impact water quality, and finding alternatives to reduce those impacts, are objectives of tributary strategies. Marketing social change of this magnitude is a challenge that Virginia will deal with steadily using a variety of approaches. Reaching millions of individuals with these messages will take time and money, and there must be enduring popular support among the citizens and elected leaders across the watershed.

Ongoing tributary strategy implementation cannot be seen as a process that is separate from other ongoing water quality initiatives. In fact, tributary strategies should be seen as a way to connect and incorporate local water quality initiatives.

For example, many counties, some aided by local conservation nonprofit organizations, are developing local watershed management plans in their communities. These plans look at subwatersheds of the tributary as a whole when planning new development or assessing other impacts on land and water resources. Planning at this scale reveals where individual BMPs are needed within each community in the basin. Locations for the many nonpoint sources BMPs in the tributary strategy can be determined using this technique. These local watershed plans can play key roles as a part of the implementation for a basin wide tributary strategy.

Likewise, mandated plans to restore stream segments on the federal impaired waters list, known as TMDLs (Total Maximum Daily Loads) can also be part of a larger tributary strategy. These TMDLs deal with stream segments that violate water quality standards for specific impairments such as bacteria, pH or dissolved oxygen. They do not specifically address nutrient or sediment impairments. However, the implementation plans for upstream TMDLs will also lessen nutrient and sediment loads. So, those measures included in TMDL implementation may be incorporated into the larger tributary strategy for that river basin.

II. The James River Watershed

James River Watershed Fast Facts

- *Drainage Area in Acres: 6,551,345*
- *Square Miles: 10,236.4*
- *About 24 percent of Virginia's land*
- *Length: 350 miles*
- *Counties: 57*
- *Cities: Buchanan, Buena Vista, Clifton Forge, Charlottesville, Chesapeake, Colonial Heights, Covington, Hampton, Hopewell, Lexington, Lynchburg, Newport News, Norfolk, Petersburg, Portsmouth, Richmond, Suffolk, Virginia Beach, Williamsburg*
- *2000 Population: 2,604,246 (Upper James = 91,607; Middle James = 1,221,792; Lower James = 1,290,847)*
- *Headwaters: Jackson and Cowpasture Rivers*
- *Larger Tributaries: Appomattox River, Chickahominy River, Hardware River, Jackson River, Maury River, Rivanna River*
- *Land Use: 5 percent urban, 17 percent agriculture, 71 percent forest, 4 percent open water, 3 percent wetland.*

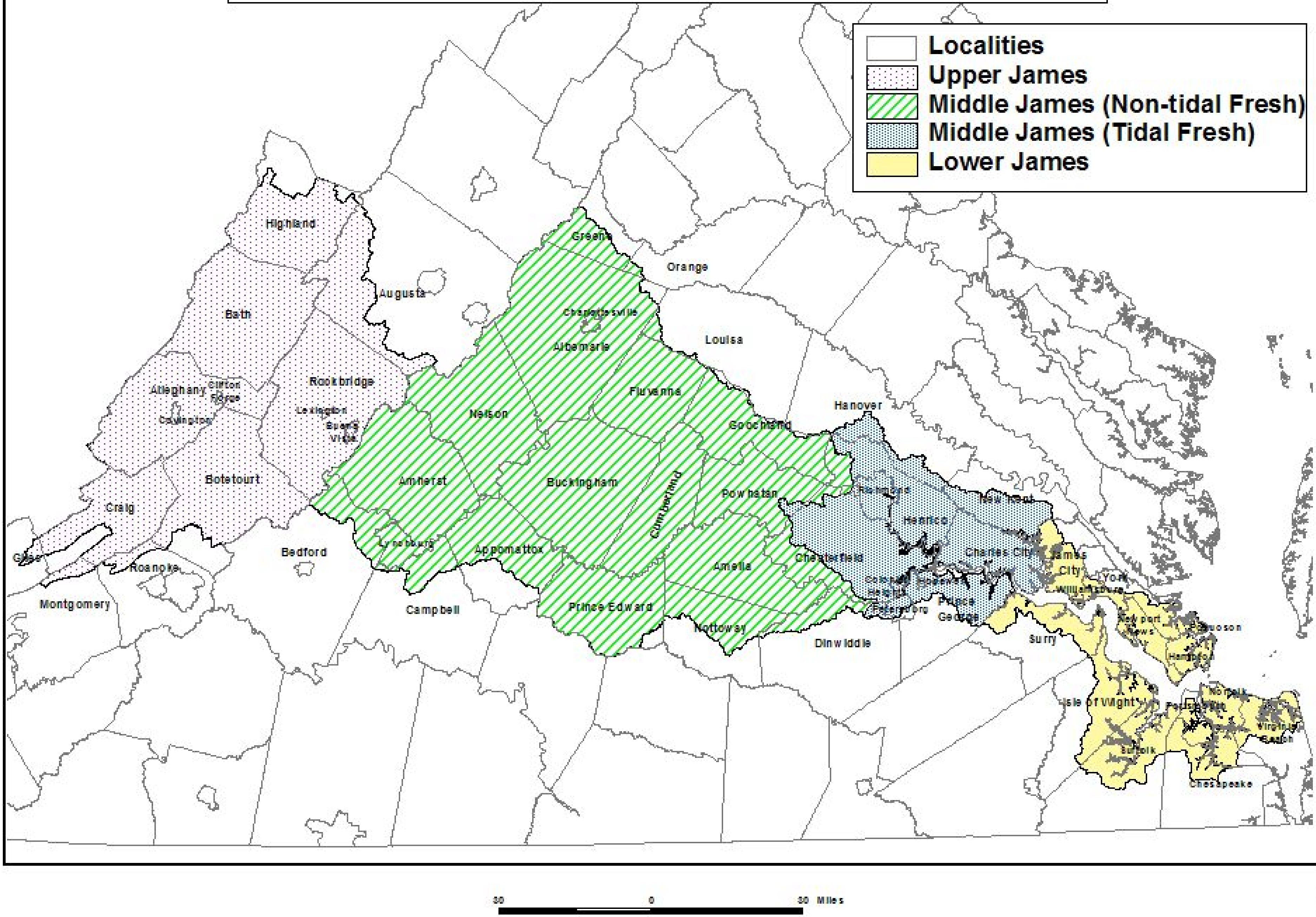
Virginia's James River is the nation's longest river contained entirely in one state. Its watershed, at 10,236 square miles is the state's largest. It makes up nearly a quarter of the state and includes 57 counties. The 2000 James River watershed population was 2,604,246 people, most living in eastern regions.

While this tributary strategy looks at the watershed as a whole, due to the size and the diversity of land uses, three teams were developed to look at the upper, middle and lower portions of the James.

Upper James River

The headwaters of the Upper James River originate in Bath and Highland Counties within the Alleghany Mountains. The 3,065 square mile watershed encompasses Craig, Botetourt, Alleghany, Bath, Highland, Rockbridge, and portions of Montgomery, Roanoke, and Augusta counties. Nearly 84 percent of the land is forested, 15 percent in agriculture (primarily pastureland), and less that one percent is considered developed. Population in the year 2000 was 85,669 within the watershed; this number is expected to increase 2.4 percent between 2000 and 2020. Most of the region is rural with low population densities, though urban hubs can be found in the cities of Clifton Forge, Buena Vista, Covington, and Lexington.

James River Watershed



Recreational opportunities abound within the watershed. As large portions of land are found within the George Washington/Jefferson national forest there are numerous hiking, camping, wildlife observation, and hunting opportunities. Portions of the Upper James are designated as Scenic River by the General Assembly, and fishing and canoeing are prized pastimes.

Reports from the 1998 *Virginia Initial James River Basin Tributary Nutrient and Sediment Reduction Strategy* indicate that sediment is the most significant water pollutant to the Upper James. Proportionally speaking, the Upper James generates roughly 30 percent of the basin-wide controllable sediment load.

Topography plays a significant role in sediment contribution as land slopes are at their steepest in the upper portions of the basin. Steeper slopes can lead to higher erosion rates. Additionally, the dense network of tributaries within the upper reaches of the James far exceeds those found in lower segments. Coupling higher slope related erosion potential with a denser stream network lends itself to the increased potential for sedimentation of the waters that feed the Upper James. Conversely, this segment contributes low percentages of nitrogen and phosphorus to the overall basin. The 1998 report cites controllable nitrogen load levels contributed to the James from this upper segment at four percent and about 19 percent for phosphorus. Agriculture is listed as the primary source for both.

Nonpoint sources of nutrient and sediment loading include agriculture, forest, and urban land uses in the Upper James. According to DCR's 1996 Nonpoint Source Pollution Watershed Assessment Report, watersheds around the cities within the Upper James are considered as high priority for urban nonpoint source pollution. It also lists five watersheds as having high potential for agricultural pollution, and fifteen watersheds as high priority for forest harvest activity. Point source contributors within the region include five municipal wastewater treatment plants and three industrial facilities.

Middle James River

The Middle James region of the watershed extends west to Amherst County, north to Greene County, south to Prince Edward County, and east to Charles City County. At approximately 6,190 square miles, the Middle James is a large and diverse watershed. Although much of the watershed is rural with a low population density, the region includes the more populous cities of Charlottesville, Colonial Heights, Hopewell, Lynchburg, Petersburg, Richmond, and several incorporated towns.

The Middle James River watershed abounds with scenic, natural, open space, and historic resources; a legacy that Virginians have worked together to protect as exhibited by Scenic River and Virginia Byway designations. In addition to these designations, more than 89,000 acres in the region are under open space easement held primarily by the Virginia Outdoors Foundation (http://www.virginiaoutdoorsfoundation.org/VOF/Statistics.htm).

The quality of life enjoyed by the citizens of the Middle James watershed is enhanced by its wealth of natural and open space resources. A number of rivers add to the scenic and environmental qualities of the area including the James, Appomattox, Chickahominy, Hardware, Rivanna, Rockfish and Willis. Because the Middle James River watershed covers the Blue Ridge, Piedmont, and Coastal Plain physiographic provinces, the region offers a variety of natural terrain and habitats, as well as recreational opportunities including hiking, canoeing, bird watching, and fishing. By protecting water quality, habitat, and other natural resources, we can ensure these and many other activities will be enjoyed for many years to come.

Land use in the Middle James watershed is predominantly forest, making up approximately 71 percent of the sub-watershed. Agriculture comprises the second largest land use in the segment with 18 percent; developed lands are third with four percent; wetlands, three percent, and, water and barren lands both equate to two percent of the watershed. Although residential, agricultural, and logging land uses are major sources of nonpoint source sediment and nutrient loadings, it is important to mention that the watershed harbors industrial and municipal wastewater treatment facility point sources as well.

The 2000 Middle James River watershed population was determined by the U.S. Census to include 1,515,843 residents. This is an increase of 15.5 percent from the 1990 Census. Predictions made by the Virginia Employment Commission indicate that the Middle James watershed population will grow another 11.8 percent by 2010 to approximately 1,694,302 inhabitants. Providing for an additional 202,600 residents moving into the watershed will result in further land cover and land use conversion, as well as increase the potential for point and nonpoint source pollution Additional population information is found in Appendix E.

Lower James River

The Lower James River encompasses the land area that drains to the James River from the counties of York, James City County and Isles of Wight and the Cities of Hampton, Newport News, Williamsburg, Norfolk, Portsmouth, Suffolk, Chesapeake and Virginia Beach. In addition, two western coastal subbasins that drain directly to the Bay are included in the Lower James River area, one to the North of Hampton (Poquoson and Back River) and one in Northern Norfolk/Virginia Beach (Lynnhaven and Little Creek). These coastal subbasins have been included within the Lower James Region because they are tributaries to the Chesapeake Bay and they lie within the boundaries of the local governments participating in the James strategy. It is assumed that nutrient and sediment reductions goals to be achieved in these areas would be the same as those selected for the Lower James Region, and the control programs implemented to achieve nutrient and sediment reductions goals would be consistent throughout a jurisdiction.

The Lower James Region is approximately 1,770 square miles. The Lower James is known for its large military installations and outstanding port facilities, and is an important center of manufacturing and tourism. The area is substantially urbanized. As a result, the key water quality issues focus on stormwater runoff control, wastewater treatment plant discharges, and to a lesser extent on agricultural runoff. The land use for this region is thirty-one percent forested, forty-eight percent urban and suburban, six percent mixed open, twelve percent agricultural, and three percent open water.

Underwater grasses (Submerged Aquatic Vegetation or SAV)

The long-term resurgence of underwater grasses is critical to the overall restoration of the Chesapeake Bay. As a result, Chesapeake Bay Program partners have placed a great deal of emphasis on developing the best science available to assist the return of underwater grasses to historic levels. To determine the progress of underwater grass restoration, the Virginia Institute of Marine Sciences (VIMS) conducts an annual survey of underwater grasses. This survey is derived from the analysis of more than 2,000 black and white aerial photographs taken between May and October. Other research within the watershed includes an ongoing study on underwater grasses (wild celery) in the tidal fresh portion of the James River. This study is a partnership between the Hopewell Regional Wastewater Treatment Facility, VIMS, and the Chesapeake Bay Foundation. The purpose of the study is to determine why historic underwater grass beds have not repopulated in the James River near Hopewell since the 1940s and to reestablish underwater grasses to the area.

The new Bay-wide goal for underwater grasses restoration is 185,000 acres by 2010. The James River watershed is responsible for 3,483 acres, or approximately 1.9 percent of the total acreage. Based on survey results from the VIMS research project, an additional 2,871 acres of underwater grasses are necessary to meet this restoration goal, based on the 2002 figures (Table 2). While the data is not conclusive, water clarity is a key component to the success of SAV restoration. Sediment loads within the James are the primary clarity-limiting factor. To this end, achieving the goal will require extensive coordination and support from state agencies, local governments, and non-profit watershed groups such as the Chesapeake Bay Foundation and Alliance for the Chesapeake Bay and others.

Segment	**1985**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2010 Goal**
Mouth of the James River (JMSPH)	0	46	187	130	77	94	232	281	604
Lower James River (JMSMH)	0	0	3	2	3	2	2	1.5	531
Lower Elizabeth River (ELIPH)	-	-	-	-	-	-	-	-	0
Middle Elizabeth River (ELIMH)	-	-	-	-	-	-	-	-	0
Western Branch, Elizabeth River (WBEMH)	-	-	-	-	-	-	-	-	0
South Branch, Elizabeth River (SBEMH)	-	-	-	-	-	-	-	-	0
Eastern Branch, Elizabeth River (EBEMH)	-	-	-	-	-	-	-	-	0
Lafayette River (LAFMH)	-	-	-	-	-	-	-	-	0
Chickahominy River (CHKOH)	nd	nd	nd	507	91*	535	268	186	348
Middle James River (JMSOH)	nd	nd	nd	15	nd	10	15	12	7
Upper James River (JMSTF)	nd	nd	nd	89	nd	66	95	84	1600
Appomattox River (APPTF)	-	-	-	-	-	-	-	-	319
Mouth of the Chesapeake Bay (CB8PH)	0	11	11	10	7	7	8	10	6
Lynnhaven & Broad Bays (LYNPH)	93	75	39	41	94	48	43	38	69
James River Restoration Totals	**93**	**132**	**237**	**794**	**272**	**762**	**663**	**613**	**3,484**

Major pollutants and water quality

The three major pollutants targeted in the tributary strategy process are nitrogen, phosphorus and sediment. Approximately 59 percent of the nitrogen and 70 percent of the phosphorus loads to the James River originate from nonpoint sources. Most nonpoint source pollutants come in stormwater runoff from agricultural lands, residential lands and other urban areas. The other 41 percent of the nitrogen and 30 percent of the phosphorus loads come from point source discharges (municipal sewage and industrial wastewater plants). Soil erosion is considered 100 percent nonpoint source related. It comes mainly from construction sites and stream banks.

Water quality impacts from excessive inputs of nutrients and sediment in the James River include excessive algae levels in some regions of the river during spring and summer, and diminished acreage and health of underwater grasses throughout the tidal portion of the river.

The following sections present only a very general overview of selected water quality conditions in the tidal portions of Virginia's Chesapeake Bay and its major tributaries, with a focus on the James River. It is difficult to adequately summarize the James basin's water quality in such a short document. Much more comprehensive and detailed analyses are available for each major Bay basin, and the reader is encouraged to supplement this brief status and trends information with several reports available through the DEQ Chesapeake Bay Program Internet webpage www.deq.state.va.us/bay/wqifdown.html and the DEQ Water Programs' Reports webpage www.deq.state.va.us/water/reports.html.

Water quality conditions are presented through a combination of the current status and long-term trends for nitrogen, phosphorus, chlorophyll, dissolved oxygen, water clarity, and suspended solids. These are the indicators most directly affected by nutrient and sediment reduction strategies. Environmental information regarding other important conditions in Chesapeake Bay (e.g., underwater grasses, fisheries, chemical contaminants) are available in the 2004 biennial report, "Results of Monitoring Programs And Status of Resources", available via the webpage for the Secretary of Natural Resources www.naturalresources.virginia.gov.

The Virginia Chesapeake Bay and its tidal tributaries continue to show environmental trends indicating progress toward restoration to a more balanced and healthy ecosystem. However, the Bay system remains stressed and some areas and indicators show continuing degradation. Progress in reducing nutrient inputs has made measurable improvements and it is expected that continued progress toward nutrient reduction goals, along with appropriate fisheries management and chemical contaminant controls, will result in additional Bay improvements. Findings from the last 18 years (1985 through 2002) of the monitoring programs are discussed in the sections below.

Nutrients influence the growth of phytoplankton in the water column. Elevated concentrations of these nutrients often result in excessive phytoplankton production (i.e., chlorophyll). Decomposition of the resulting excess organic material during the summer can result in low levels of dissolved oxygen (D.O.) in bottom waters. These low D.O. levels can cause fish kills and drastic declines in benthic communities, which are the food base for many fish populations. Low-D.O.

waters also adversely affect fish and crab population levels by limiting the physical area available where these organisms can live.

Phosphorus: Figure 1 presents current status and long-term trends in phosphorus concentrations. Areas of the **Elizabeth**, and lower **James** River have the poorest conditions in relation to the rest of the Chesapeake Bay system. The status of other tidal segments of the **James River** is considered good, but the **Appomattox** is rated fair. Improving trends are seen in sections of the **Elizabeth**, and in the main Bay outside the mouth of the **James**.

The “watershed input” stations shown in Figure 1 provide information about the impacts of nutrient control efforts in the upper watershed (above the fall line). Results at these watershed input monitoring stations are flow-adjusted in order to remove the influence of river flow and assess only the effect of nutrient management actions (e.g., point source discharge treatment improvements and BMPs to reduce nonpoint source runoff). The watershed input station for the **James** shows improving concentration trends.

Nitrogen: Figure 2 presents status and long-term trends in nitrogen concentrations. Status of nitrogen in the **South** and **East Branches** of the **Elizabeth** River is worse than status in the other major tributaries and the **Virginia Chesapeake Bay**. Much of the James River has good relative status, with the exception of the **Appomattox** River, **Hampton Roads** area, and remainder of the **Elizabeth**, which have fair status.

Much of the tidal **James** River has improving nitrogen trends as a result of declining loads at the river input station as well as reduced discharges from several of the point sources in the Richmond-Hopewell areas. One exception is seen in the Appomattox, where a declining trend is evident. The trends in nitrogen levels are also improving in the **Elizabeth** River.

Chlorophyll: Chlorophyll is a measure of algal biomass (i.e., phytoplankton) in the water. High chlorophyll levels indicate poor water quality (low D.O. conditions): the decomposition of dead phytoplankton and other organic material that settles to the bottom depletes the available oxygen. High algal levels can also reduce water clarity, which decreases available light required to support photosynthesis in underwater grasses. High algal levels also indicate problems with the food web such as decreased food quality for some filter-feeding fish and shellfish. Finally, high chlorophyll levels may indicate large-scale blooms of toxic or nuisance forms of algae.

Figure 3 presents the current status and long term trends in chlorophyll concentrations. Parts of all of the major Virginia tributaries have poor status in relation to Bay-wide conditions, including the **Tidal Fresh James** from the fall line to below Hopewell, the **Appomattox**, **Chickahominy**, and portions of the **Elizabeth** River. A degrading trend in chlorophyll levels was detected in the upper tidal fresh portions of the **James**, and **Appomattox** Rivers. An improving trend was observed in the **West Branch** of the **Elizabeth** River.

Dissolved Oxygen: Dissolved oxygen levels are an important factor affecting the survival, distribution, and productivity of aquatic living resources. Figure 4 shows the current status and long term trends in D.O. concentrations. Status is given in relation to dissolved oxygen levels supportive or stressful to living resources. About half of the Virginia **Chesapeake Bay** and smaller portions of the tidal tributaries had only fair status, including the **South** and **East Branches** of the **Elizabeth** River. The remainder of the tidal **James** had good status for dissolved oxygen. The **James** does not typically experience depressed D.O. conditions due to its closeness to the ocean and good mixing through the water column. Trends for dissolved oxygen are improving throughout the tidal **James** River.

Figure 1) Total Phosphorus Status and Trends

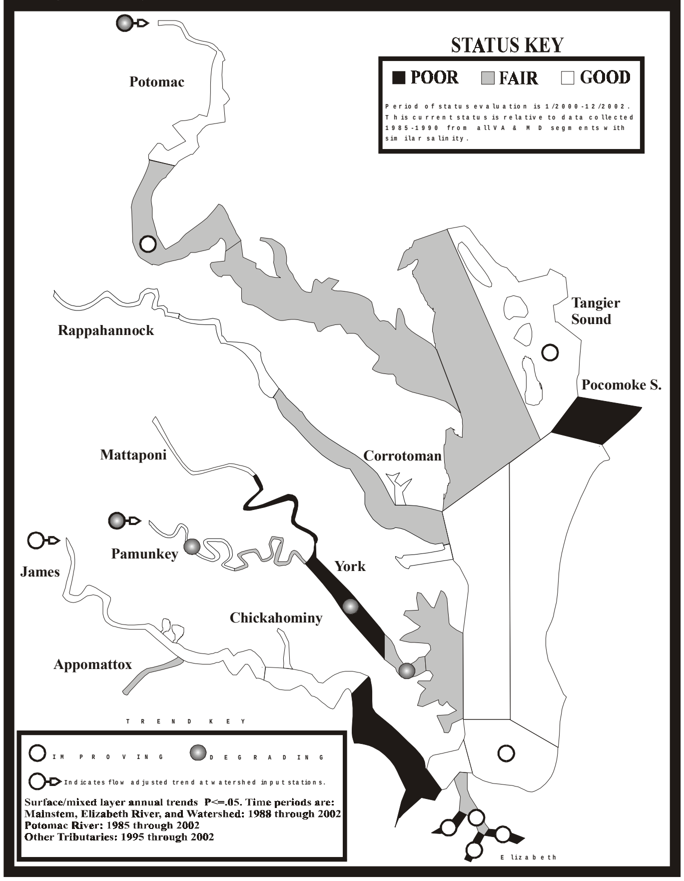


Figure 2) Total Nitrogen Status and Trends

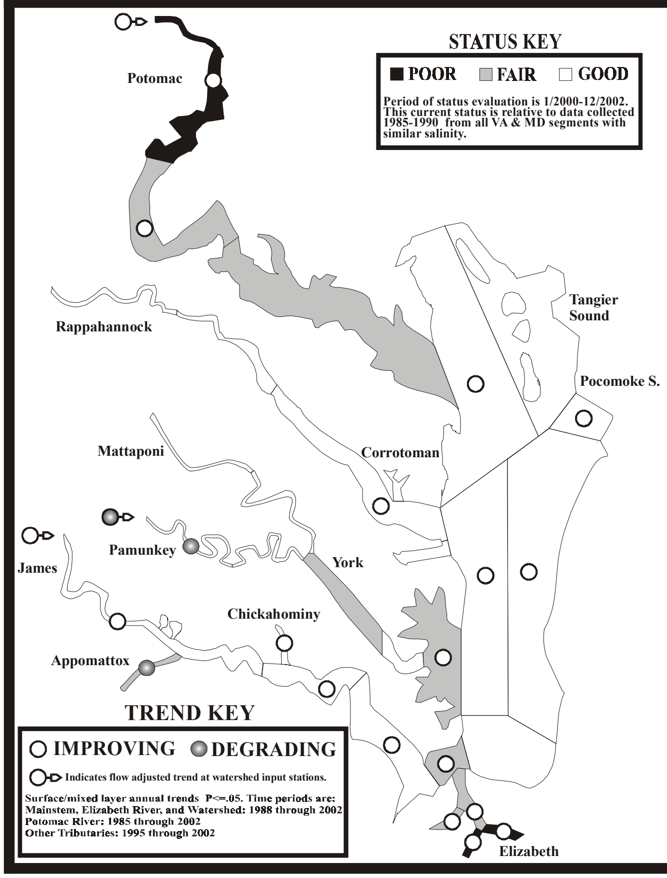
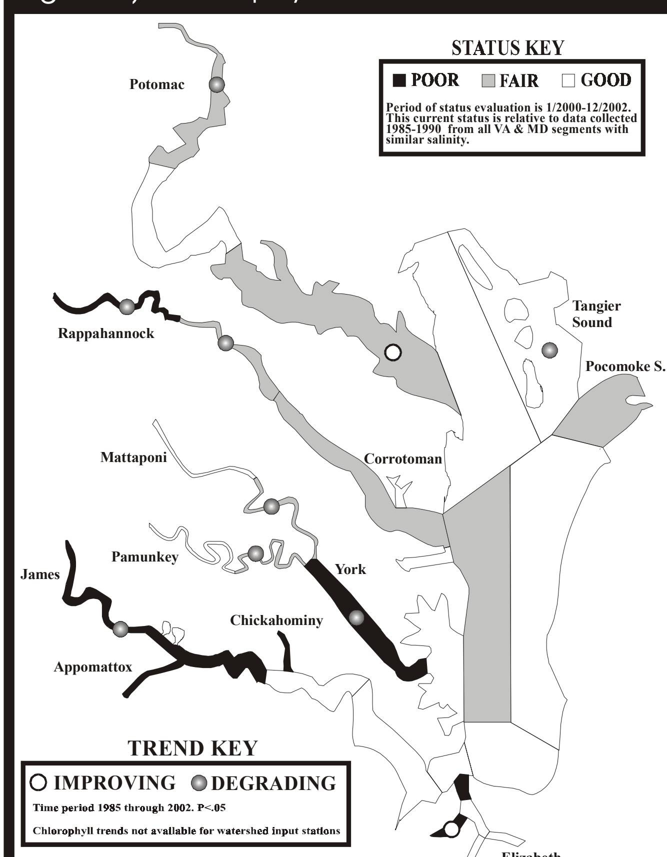


Figure 3) Chlorophyll Status and Trends



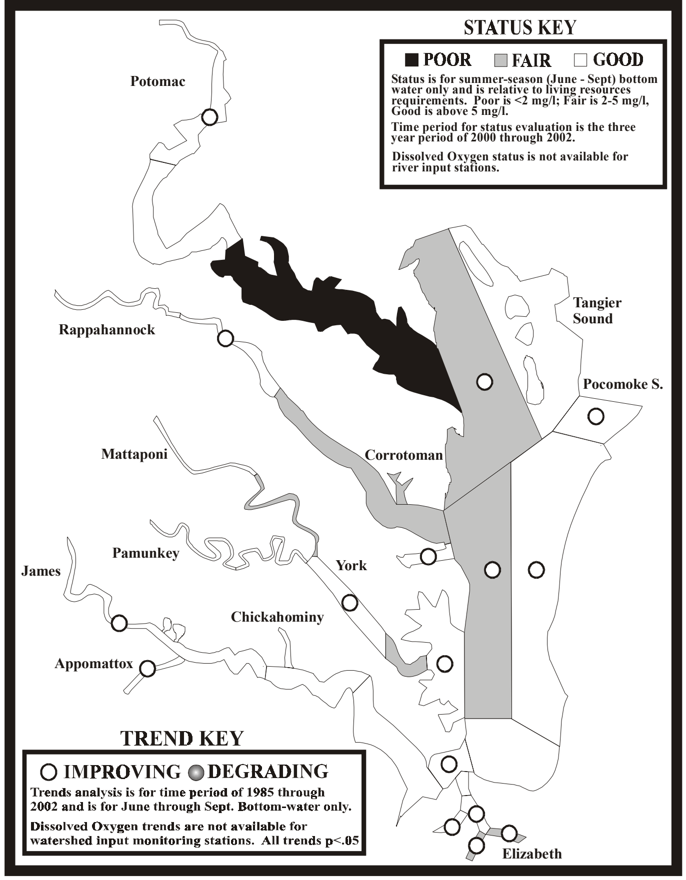
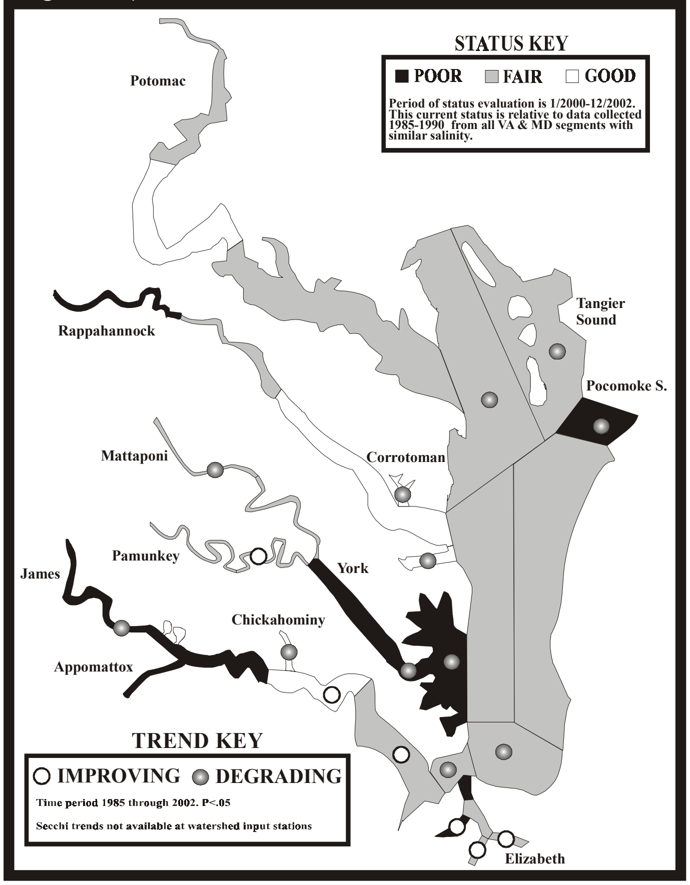


Figure 4) Dissolved Oxygen Status and Trends

Water Clarity: Water clarity is a measure of the depth to which sunlight penetrates through the water column. Poor water clarity can indicate that inadequate conditions for the growth and survival of underwater grasses. Poor water clarity can also affect the health and distributions of fish populations by reducing their ability to capture prey or avoid predators. The major factors that affect water clarity are: 1) concentrations of particulate inorganic mineral particles (i.e., sand, silt and clays), 2) concentrations of algae, 3) concentrations of particulate organic detritus (small particles of dead algae and/or decaying marsh grasses), and 4) dissolved substances which "color" the water (e.g., brown humic acids generated by plant decay). Which of these factors most greatly influence water clarity varies both seasonally and spatially.

Figure 5 presents the current status and long term trends in water clarity. Status of many segments within the tributaries and the Chesapeake Bay mainstem is only fair or poor, and this is evident in the **James** basin, with fair status in the **Lower James**, **Hampton Roads** area, and parts of the **Elizabeth** Rivers. Poor status is evident in the **Tidal Fresh James** from the fall line to below Hopewell**,** the **Appomattox,** and portions of the **Elizabeth** River. This suggests that poor water clarity is one of the major environmental factors inhibiting the resurgence of underwater grasses in the tidal portion of the James River. Degrading trends in water clarity were detected in the **Tidal Fresh James, Chickahominy**, and **Hampton Roads** area. These degrading trends represent a substantial impediment to the recovery of grass beds within Chesapeake Bay. An improving trend in water clarity was evident in the **Middle and Lower James**, and **Elizabeth** River. Possible causes of the degrading trends include increased shoreline erosion as a result of waterside development, loss of wetlands, increased abundance of phytoplankton, or a combination of sea level rise and land subsistence.

Figure 5) Water Clarity Status and Trends

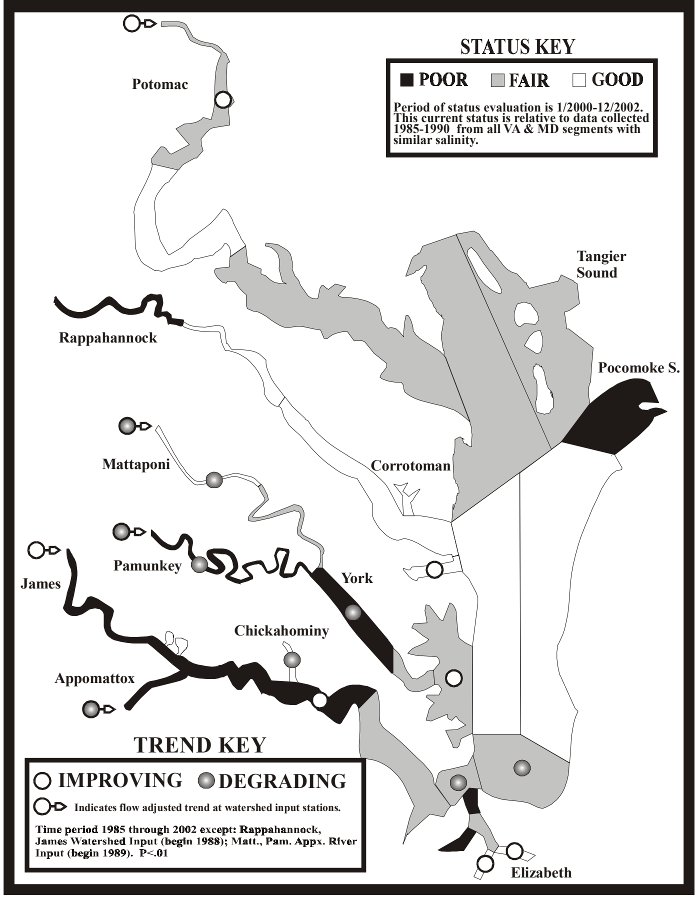


Suspended Solids: Suspended solids are a measure of particulates in the water column including inorganic mineral particles, planktonic organisms and detritus which directly controls water clarity. Elevated suspended solids can also be detrimental to the survival of oysters and other aquatic animals. Young oysters can be smothered by deposition of material and filter-feeding fish such as menhaden can be negatively affected by high concentrations of suspended solids. In addition, since suspended solids are comprised of organic and mineral particles that may contain nitrogen and phosphorus, increases in suspended solids can result in an increase of nutrient concentrations.

Figure 6 presents the current status and long term trends in suspended solids concentrations. The entire length of the tidal **James** is rated either fair or poor status for suspended solids, with the exception of good status in the **South** and **East Branches** of the **Elizabeth** River. Poor status is seen in the mainstem **James** River from the fall line to below Jamestown, the **Appomattox**, and parts of the **Elizabeth** River, and fair status is observed in the **Lower James**, **Hampton Roads** area, and remainder of the **Elizabeth** River.

An improving trend in the flow-adjusted concentration at the **James River** watershed input station suggests that management actions to reduce sediment loads may be working. Improving trends were also seen in the middle **James**, and **South** and **East Branches** of the **Elizabeth**. However, several degrading trends in suspended solids concentrations were detected, including the **Appomattox** watershed input station, **Chickahominy**, **Hampton Roads** area, and the main Bay just outside the mouth of the **James**.

Figure 6) Suspended Solids Status and Trends



III. Strategy Practices and Treatments

Nutrient and sediment allocations and reduction goals

The James strategy is one of five developed for Virginia's Chesapeake Bay basins. While each basin had specific nutrient and sediment load allocations to reach, they are a part of overall Virginia Chesapeake Bay nutrient and sediment reduction goals. As the result of the efforts by state staff and stakeholders in all five basins Virginia has crafted a series of strategies that surpassed Virginia's nitrogen, phosphorus and sediment goals.

Table 1: Allocations and Scenarios by Basin and Statewide

	TN (LBS/YR)		
	2002 Progress	2010 VA Strategy	2010 Cap Load Allocation
Potomac	22,844,023	12,589,458	12,839,755
Rappahannock	7,899,245	5,309,703	5,238,771
York	7,679,383	5,362,111	5,700,000
James	37,258,742	24,518,310	26,400,000
Eastern Shore	2,122,892	948,292	1,222,317
VA TOTAL	**77,804,285**	**48,727,874**	**51,400,843**
	TP (LBS/YR)		
	2002 Progress	2010 VA Strategy	2010 Cap Load Allocation
Potomac	1,951,741	1,176,908	1,401,813
Rappahannock	954,358	692,870	620,000
York	749,445	538,103	480,000
James	5,952,375	3,486,427	3,410,000
Eastern Shore	227,205	86,734	84,448
VA TOTAL	**9,835,124**	**5,981,043**	**5,996,261**
	SED (TONS/YR)		
	2002 Progress	2010 VA Strategy	2010 Cap Load Allocation
Potomac	720,462	403,221	616,622
Rappahannock	335,183	247,000	288,498
York	126,987	97,999	102,534
James	1,174,351	791,403	924,711
Eastern Shore	22,036	8,002	8,485
VA TOTAL	**2,379,018**	**1,547,624**	**1,940,849**

Allocations for the James River

Table 2 shows the allocated nitrogen, phosphorus, and sediment loads to the James River and its associated small coastal basins in millions of pounds per year (million of tons in the case of sediment). These limits represent the pollutant loads that are needed to remove the tidal James River from the impaired waters list, thus leading to much-improved water quality and habitat for Bay living resources such as fish and submerged aquatic vegetation. Table 3 provides loads for nutrients and sediment for the "baseline" year (1985) and for 2002, the most recent figures available. The 1985 baseline nutrient load is the sum of both point source discharges and the nonpoint nutrient runoff, associated with 1985 land uses calculated for an average rainfall year.

Table 2. 2003 James River Watershed Total Nutrient (Nitrogen & Phosphorus) and Sediment Allocations

SUB-BASINS	TN (LBS/YR) Cap Load ALL SOURCES	TP (LBS/YR) Cap Load ALL SOURCES	TS (TONS/YR) Cap Load ALL SOURCES
UPPER JAMES	1,902,359	714,520	406,160
MIDDLE JAMES	18,626,736	2,099,856	482,808
LOWER JAMES	5,870,905	595,624	36,308
TOTAL JAMES	26,400,000	3,410,000	925,276

Table 3. James River Watershed 1985 and 2002 Total Nitrogen, Phosphorus and Sediment Loads

SUB-BASINS SOURCES	TN (LBS/YR) 1985 ALL SOURCES	TN (LBS/YR) 2002 ALL SOURCES	TP (LBS/YR) 1985 ALL SOURCES	TP (LBS/YRS) 2002 ALL SOURCES	TS (TONS/YR) 1985 ALL SOURCES	TS (TONS/YR 2002 ALL
UPPER	2,375,462	2,241,254	1,173,587	1,445,922	551,981	515,376
MIDDLE	27,967,752	21,560,775	4,634,636	3,163,254	635,988	577,860
LOWER	17,002,327	13,456,744	2,835,142	1,343,197	78,310	81,114
TOTAL JAMES	30,360,543	37,258,773	8,643,365	5,952,373	1,266,279	1,174,350

Table 4. James River Watershed – Nutrient Reductions Categorized by Point Source (PS) and Nonpoint Source (NPS)

SUB BASIN	PS N (LBS/YR)	PS P (LBS/YR)	NPS N (LBS/YR)	NPS P (LBS/YR)
UPPER	173,049	260,249	1,301,128	509,878
MIDDLE	4,917,831	461,176	8,798,397	1,367,558
LOWER	5,374,960	456,677	3,952,942	430,889
TOTAL JAMES	10,465,840	1,178,102	14,052,467	2,308,325

The James River nitrogen load allocation includes 1.5 million lb TN/yr that Virginia accepted as its contribution to eliminating the “orphan” load (8 million lbs TN/yr) identified by the Bay Program’s Water Quality Steering Committee prior to the establishment of final allocation values for each of the major basins in the Chesapeake Bay watershed. This “orphan” load could not be attributed to a specific Bay basin after initial allocations were developed. The Water Quality Steering Committee led negotiations among the Bay jurisdictions to split up the eight million pounds.

Further, it was recognized that the James River has a very slight influence on the Chesapeake Bay, and virtually none on Bay segment CB4 (located approximately in the middle of the Bay from just south of Baltimore, MD to north of the Potomac River mouth). This region of the Bay is the most severely affected by low dissolved oxygen conditions, and it is thought that if that area can be improved sufficiently, allowing its removal from the §303(d) impaired waters listing, then all other impaired areas of the Bay will also improve to the point of meeting new Bay water quality criteria and state water quality standards now being developed. Because of the lack of influence of the James River on those areas of the Bay, its load cap allocations were established specifically for delisting the impaired tidal portion of the river. Analyses performed by Bay Program and jurisdiction specialists resulted in the nitrogen, phosphorus, and sediment caps listed above.

State agency staff, considering input from stakeholders, developed an approach to apportion the nitrogen, phosphorus, and sediment cap loads for the entire basin to each of the three James River tributary strategy planning regions. This included consideration of the following factors:

- A region's or source's relative contribution to the nutrient and sediment reduction effort should be proportional to the current loads delivered to the tidal portion of the James River.
- Sources closest to the region where the greatest environmental benefit is expected to be realized (i.e., the tidal fresh James region) should be targeted for nutrient and sediment reductions. The potential for environmental improvements in other areas of the James River (particularly the Lower James) should be analyzed and confirmed using the Bay Program's Water Quality Model.
- The strategy should focus on reduction actions that are feasible, cost effective, and equitable.
- At a minimum, nutrient and sediment reduction actions identified in the 2000 James Tributary Goals document should be maintained. It is already known that a basin-wide increase in the level of effort will be necessary to reduce the nitrogen load to meet the new allocation agreed to by Virginia. This is due to the inclusion of the additional 1.5 million pounds of nitrogen to be reduced (Virginia's share of the "orphaned load"), and revised estimates of the total delivered loads due to upgrades in the Bay Program's Watershed Model.

Taking these factors into account, and knowing the total cap loads that must be met for the entire basin, stakeholder tributary teams in each of the planning areas worked to develop tributary strategy recommendations appropriate for their region.

Strategy development

As soon as nutrient and sediment allocations were received, stakeholder teams were formed in each of Virginia’s major Chesapeake Bay tributary basins to guide and assist in preparing a strategy to meet the ambitious allocations. While the James basin is being addressed in one comprehensive strategy, separate tributary teams were created in the Upper, Middle and Lower sections of the basin. This was seen as the most efficient way to develop a workable, stakeholder-driven process given the size and distinctive land uses and corresponding water quality issues found in this, the largest of Virginia's Chesapeake Bay basins.

While there were some very real differences in these three sub-basins, many principles of the strategy development were similar. In each of the sub-basins efforts were made to ensure that the tributary teams formed were representative of the diverse stakeholder interests. Team representatives include citizens, farmers, soil and water conservation districts, private industry, environmental groups, wastewater treatment plant operators, and local, state, and federal government agencies from both nonpoint and point sources of nutrient pollution. A complete listing of members and affiliations may be found in Appendix A.

Team members worked with state staff to review existing conditions in their basin in recommending a mix of nonpoint source practices and point source treatment levels. In their work they considered the existing structure, responsibilities and workload of the governmental and private entities that would be involved in implementing these practices. They worked within the framework of existing state laws, regulations and authorities. Even assuming optimal funding their initial mix of practices came up short of the basin's nutrient and sediment load allocations.

State staff then took the stakeholders work and added practices and treatments using as its only restrictions existing technologies, land availability, animal units and other variables related only to the practices themselves. They did not factor in government responsibilities, infrastructure or availability of funding.

This analysis showed that it is feasible to meet the imposing allocation goals set for each basin. However, it also showed that considerable analysis of the barriers to implementation need to be explored and addressed. This document will begin that exploration in Section IV.

Scenario results

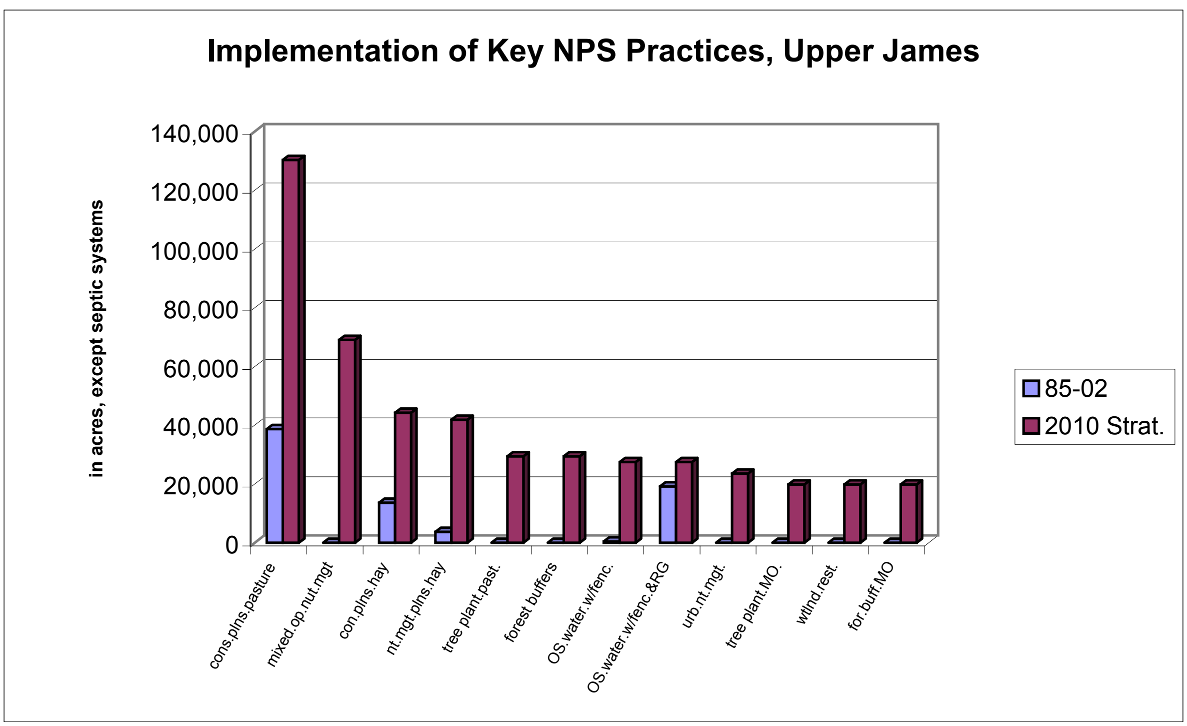
The draft James River Tributary Strategy proposes an input with estimated 2010 basin-wide annual loads of 24.52 million pounds of nitrogen, 3.49 million pounds of phosphorus and 790,000 tons of sediment, as calculated by the Watershed Model. Both nonpoint source practices and point source treatment levels were explored to achieve the reductions proposed. This section will look at both the nonpoint source and point source "input decks" or those lists of practices and treatment levels proposed. A more detailed input deck is found in Appendix B.

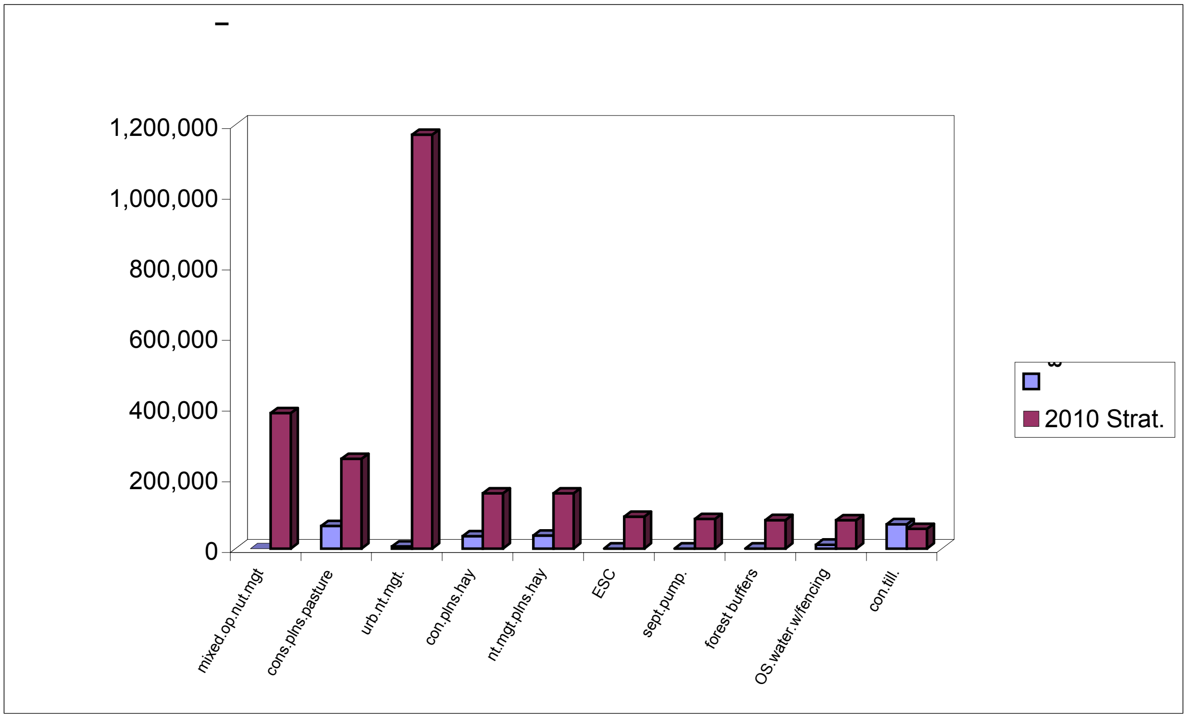
Table 5. Nonpoint source input deck, James River basin.

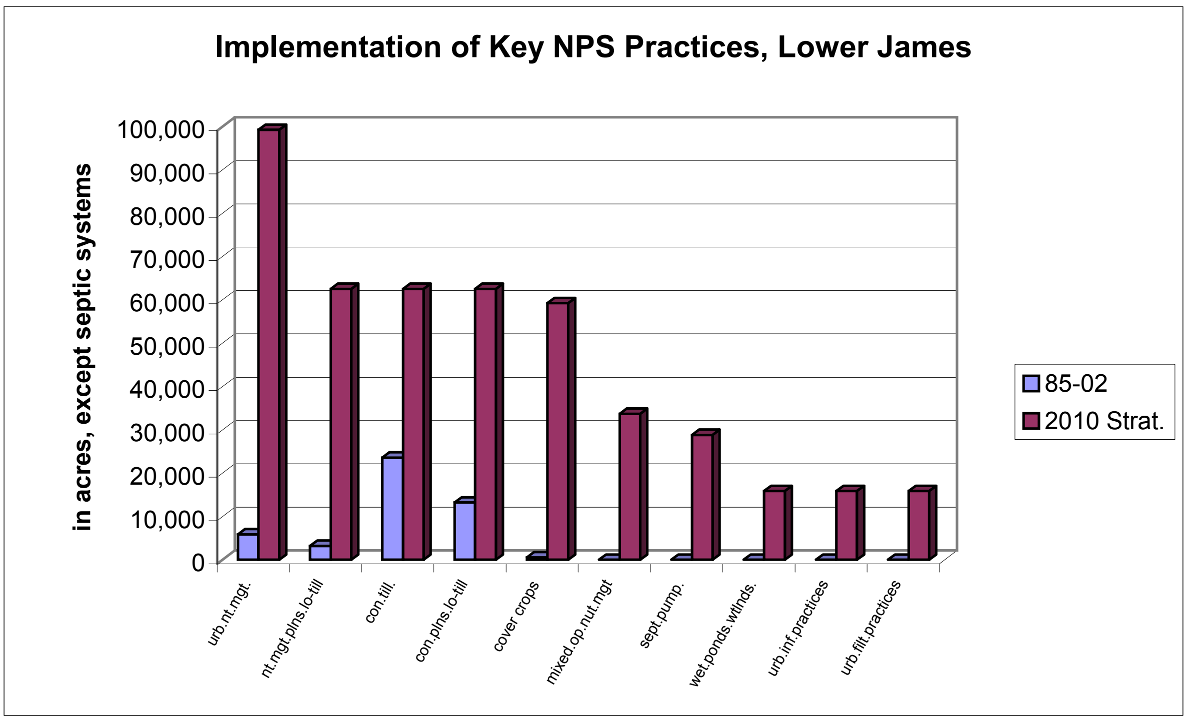
BMP Name	Upper James	Middle James	Lower James	James TOTAL
Forest Buffers	63741	169000	8269	241010
Wetland Restoration	32509	32213	2152	66874
Land Retirement	0	0	0	0
Grass Buffers	1825	11686	5808	19319
Tree Planting	61916	45627	2339	109882

Conservation-Tillage	8093	55508	62524	126125
Urban Forest Buffers	5295	32166	5557	43018
Tree Planting	5295	2145	1111	8551
Nutrient Management Plans	49521	208532	64957	323010
Yield Reserve	5501	2171	3315	10987
Conservation Plans	183028	462758	72382	718168
Cover Crops (Early-Planting)	8050	54865	60733	123648
Off-Stream Watering w/ Fencing	27447	80285	1359	109091
Off-Stream Watering w/o Fencing	13723	26762	452	40937
Off-Stream Watering w/ Fencing & Rotational Grazing	27447	53522	905	81874
Animal Waste Management / Barnyard Runoff Control	30	102	64	196
Wet Ponds & Wetlands	6014	44427	28246	78687
Infiltration Practices	6014	44427	28246	78687
Filtering Practices	6014	44427	28246	78687
Erosion & Sediment Control	5808	137986	19106	162900
Urban Nutrient Management	23476	171122	99244	293842
Mixed Open Nutrient Management	69062	383438	33712	486212
Horse Pasture Management	0	12990	622	13612
Forest Harvesting Practices	1424	7272	918	9614
Septic Connections	0	141	0	141
Septic Denitrification	1641	11163	3576	16379
Septic Pumping	12305	83719	26820	122844

Key nonpoint source best management practices for each basin are charted below.







Nonpoint source input deck summaries

Upper James

For the agriculture source category, the BMPs in the Upper James input deck focused on animal waste management systems, land conversion BMPs such as riparian forest buffers on cropland, hay and pasture (15 percent of available acres converted to forest buffers) and grass buffers on cropland (15 percent of available acres converted to grass buffers). Other land conversion BMPs that were targeted included wetland conversion and tree planting (15 percent of hay and pasture planted to trees). These land conversion BMPS have a greater effect on nitrogen, phosphorus, and sediment reductions with higher "pounds reduced/acre". Also, stream protection practices (off-stream watering with fencing, off stream watering without fencing, and off-stream watering with fencing and rotational grazing were targeted. The agronomic practices such as conservation tillage, cover crops, nutrient management and farms plans were maximized, with 90 percent of the cropland in cover crops and 95 percent in conservation tillage. These practices are very cost effective and unlike the land conversion BMPs, multiple practices can be applied to a given acre which helps to increases the nutrient and sediment reductions.

The BMPs targeted for the mixed open land use included forest buffers, wetlands restoration, and tree planting with 15 percent of the available mixed open acres being restored to forest buffers, 15 percent restored to wetlands, and 15 percent planted to trees. Nutrient management planning was applied to 95 percent of the mixed open acres.

For the urban source category the stormwater BMPs that were targeted included wet ponds and wetlands, infiltration and filtering practices. These practices are more desirable than dry detention ponds and dry extended ponds because of higher nutrient removal. Forest buffers were applied to 15 percent of the pervious urban acres and 15 percent of the pervious urban acres were planted to trees. Nutrient management was applied to 95 percent of the pervious urban acres after accounting for the land conversion practices mentioned above.

Forest harvesting practices were applied to the forest land use category. The acres treated by forest harvesting practices were based on reported data provided by the Virginia Department of Forestry.

The BMPs that were applied to the septic source category included septic tank pumpouts, and septic denitrification systems. The Chesapeake Bay Program provided projections as to the number of septic systems in operation by 2010. A septic tank pump out rate of 75 percent was used to calculate the number of pumpouts. This is based on 75 percent of the septic systems being pumped at least once by 2010. Generally, a 10 percent conversion to septic denitrification was applied.

Middle James

For the agriculture source category, the BMPs in the input deck focused on animal waste management systems, land conversion BMPs such as riparian forest buffers on cropland (10 percent of available cropland converted to forest buffers), hay and pasture (15 percent of available acres converted to forest buffers) and grass buffers on cropland (15 percent of available acres converted to grass buffers). Other land conversion BMPs that were targeted included wetland conversion and tree planting (5 percent of hay and pasture planted to trees). These land conversion BMPS have a greater effect on nitrogen, phosphorus, and sediment reductions with higher "pounds reduced per acre". Also, stream protection practices (off-stream watering with fencing, off stream watering without fencing, and off-stream watering with fencing and rotational grazing were targeted. The agronomic practices such as conservation tillage, cover crops, nutrient management and farms plans were maximized, with 90 percent of the cropland in cover crops and 95 percent in conservation tillage, 95 percent of the cropland and hay land under nutrient management, and 95 percent of the cropland, hay, and pasture acres under a farm plan. These practices are very cost effective and unlike the land conversion BMPs, multiple practices can be applied to a given acre which helps to increases the nutrient and sediment reductions.

The BMPs targeted for the mixed open land use included forest buffers, wetlands restoration, and tree planting with 15 percent of the available mixed open acres being restored to forest buffers, five percent restored to wetlands, and five percent planted to trees. Nutrient management planning was applied to 95 percent of the mixed open acres.

For the urban source category the stormwater BMPs that were targeted included wet ponds and wetlands, infiltration and filtering practices. These practices are more desirable than dry detention ponds and dry extended ponds because of higher nutrient removal. Forest buffers were applied to 15 percent of the pervious urban acres and 1 percent of the pervious urban acres were planted to trees. Nutrient management was applied to 95 percent of the pervious urban acres after accounting for the land conversion practices mentioned above.

Forest harvesting practices were applied to the forest land use category. The acres treated by forest harvesting practices were based on reported data provided by the Virginia Department of Forestry.

The BMPs that were applied to the septic source category included septic tank pumpouts, and septic denitrification systems. The Chesapeake Bay Program provided projections as to the number of septic systems in operation by 2010. A septic tank pump out rate of 75 percent was used to calculate the number of pumpouts. The total number of systems to be pumped was based on 75 percent of the septic systems being pumped at least once by 2010. Generally, a 10 percent conversion to septic denitrification was applied.

Lower James

For the agriculture source category, the BMPs in the input deck focused on animal waste management systems, land conversion BMPs such as riparian forest buffers on cropland, hay and pasture (7.5 percent of available cropland acres converted to forest buffers and five percent of available hay and pasture converted to forest buffers), and grass buffers on cropland (7.5 percent of available acres converted to grass buffers). Other land conversion BMPs that were targeted included wetland conversion and tree planting (five percent of hay and 2.5 percent of pasture planted to trees). These land conversion BMPS have a greater effect on nitrogen, phosphorus, and sediment reductions with higher "pounds reduced/acre". Also, stream protection practices (off-stream watering with fencing, off stream watering without fencing, and off-stream watering with fencing and rotational grazing were targeted. The agronomic practices such as conservation tillage, cover crops, nutrient management and farms plans were maximized, with 90 percent of the cropland in cover crops and 95 percent in conservation tillage. These practices are very cost effective and unlike the land conversion BMPs, multiple practices can be applied to a given acre that helps to increases the nutrient and sediment reductions.

The BMPs targeted for the mixed open land use included forest buffers, wetlands restoration, and tree planting with five percent of the available mixed open acres being restored to forest buffers, five percent restored to wetlands, and five percent planted to trees. Nutrient management planning was applied to 95 percent of the mixed open acres.

For the urban source category the stormwater BMPs that were targeted included wet ponds and wetlands, infiltration and filtering practices. These practices are more desirable than dry detention ponds and dry extended ponds because of higher nutrient removal. Forest buffers were applied to five percent of the pervious urban acres and 10 percent of the pervious urban acres were planted to trees. Nutrient management was applied to 95 percent of the pervious urban acres after accounting for the land conversion practices mentioned above.

Forest harvesting practices were applied to the forest land use category. The acres treated by forest harvesting practices were based on reported data provided by the Virginia Department of Forestry.

The BMPs that were applied to the septic source category included, septic tank pumpouts, and septic denitrification systems. The Chesapeake Bay Program provided projections as to the number of septic systems in operation by 2010. A septic tank pump out rate of 75 percent was used to calculate the number of pumpouts. Generally, a baseline 10 percent conversion to septic denitrification was applied.

Point source input deck summary

Regarding point sources, there is a varying level of nutrient reduction treatment that is applied to each of the three tributary strategy planning regions. This approach reflects application of the factors described in the preceding section. However, there are aspects of the proposed treatment levels that are common to all three regions.

The point source control levels proposed for the significant facilities in the James basin would result in a total, basinwide annual discharged nitrogen load of about 11,304,800 pounds, and a phosphorus load of approximately 1,148,500 pounds, in the year 2010. While there are many combinations of treatment levels for the affected plants that could reach these load levels, for simplicity and equity the input deck assumed uniform nutrient reduction treatment within each of the planning regions at the municipal plants and equivalent controls at the industrial facilities. These are further detailed in the regional descriptions that follow.

This scenario does not set load allocations for each individual plant -- what is sought is an aggregate point source load across the entire James basin that the plants would maintain into the future. The process for setting the individual plant allocations, and procedures to establish numerical discharge permit limits for nutrients will be informed and assisted under a rulemaking now underway to revise the State Water Control Board's "Point Source Policy for Nutrient Enriched Waters". Information on revising this regulation can be found on the DEQ Chesapeake Bay Program's webpage, at this Internet address: www.deq.state.va.us/bay/multi.html.

Upper James

The Point Source tributary strategy input deck proposed for the Upper James region is as follows:

Table 6.

Facility	WSM Segment	Design Flow (MGD)	Trib Strat 2010 Flow (MGD)	Trib Strat TN Conc (mg/l)	Proposed 2010 TN Load (lbs/yr)	Trib Strat TP Conc (mg/l)	Proposed 2010 TP Load (lbs/yr)
Lower Jackson STP	270	1.50	0.50	8.0	12,183	1.00	1,523
Buena Vista STP	270	2.25	1.45	8.0	35,330	1.00	4,416
Clifton Forge STP	270	2.00	1.60	8.0	38,985	1.00	4,873
Covington STP	270	3.00	1.82	8.0	44,346	1.00	5,543
Greif Bros.	270	--	4.74	4.5	64,992	2.15	31,052
Hot Springs STP	270	0.40	0.43	8.0	10,380	1.00	1,297
Lees Carpet	270	--	0.80	9.0	21,929	9.00	21,929
Lex-Rockbridge Regional STP	270	2.00	1.20	8.0	29,239	1.00	3,655
Low Moor STP	270	0.50	0.30	8.0	7,310	1.00	914
MeadWestvaco	270	--	29.73	3.5	316,921	1.80	162,988
Totals 270 =		11.65	42.57		581,615		238,190

The Point Source tributary strategy input deck proposed for the Middle James region is as follows:

Table 7

Facility	WSM Segment	Design Flow (MGD)	Trib Strat 2010 Flow (MGD)	Trib Strat TN Conc (mg/l)	Proposed 2010 TN Load (lbs/yr)	Trib Strat TP Conc (mg/l)	Proposed 2010 TP Load (lbs/yr)
Georgia Pacific	270	--	7.21	4.5	98,818	3.00	65,879
Subtotal 270 =		--	7.21		98,818		65,879
BWXT	280	--	0.50	76.2	116,042	0.50	761
Amherst STP	280	0.40	0.25	8.0	6,043	0.50	378
L. Monticello STP	280	0.50	0.70	8.0	17,056	0.50	1,066
Lynchburg STP	280	22.00	17.4	8.0	423,963	0.50	26,498
Moores Crk. STP	280	15.00	11.89	8.0	289,708	0.50	18,107
Subtotal 280 =		37.90	30.74		852,812		46,810
Powhatan Corr. Center STP	290	0.47	0.32	8.0	7,724	0.50	483
Subtotal 290 =		0.47	0.32		7,724		483
Crewe STP	300	0.50	0.30	8.0	7,310	1.00	914
Farmville STP	300	2.40	1.10	8.0	26,802	1.00	3,350
Subtotal 300 =		2.90	1.40		34,112		4,264
Brown&Williamson	600	--	0.82	5.0	12,487	0.50	1,256
DuPont-Spruance	600	--	23.33	2.83	201,090	0.11	7,860
Falling Creek STP	600	10.10	9.20	5.0	140,103	0.50	14,010

Henrico Co. STP	600	75.00	51.00	5.0	776,656	0.50	77,666
Honeywell-Hopewell	600	--	121.00	2.96	1,091,300	0.14	52,085
Hopewell RWTF	600	50.00	35.12	8.0	855,723	0.50	53,483
Philip Morris	600	--	1.92	6.93	40,525	1.27	7,427
Proctors Crk. STP	600	21.50	18.80	5.0	286,297	0.50	28,630
Richmond STP	600	45.00	47.99	5.0	730,818	0.50	73,082
So. Central STP	600	23.00	12.93	5.0	196,905	0.50	19,691
Subtotal 600 =		224.60	322.11		4,331,904		335,190
Tysons-Glen Allen	610	--	0.98	7.14	21,311	0.30	895
Chickahominy STP	610	0.25	0.10	5.0	1,523	0.10	76
Subtotal 610 =		0.25	1.08		22,834		971
Totals =		266.12	362.86		5,348,204		453,597

The Point Source tributary strategy input deck proposed for the Lower James region is as follows:

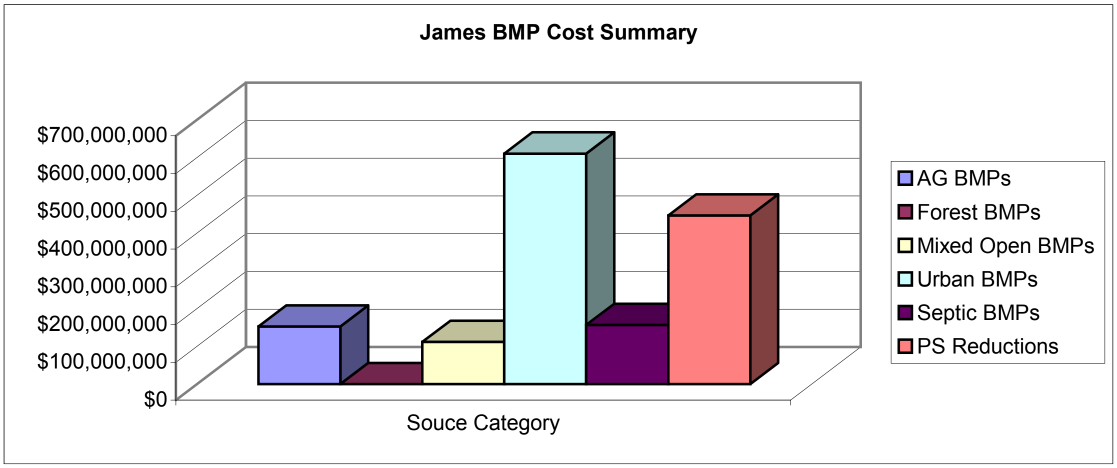
Table 8

		Design	Trib Strat	Trib Strat	Proposed 2010	Trib Strat	Proposed 2010
	WSM	Flow	2010 Flow	TN Conc	TN Load	TP Conc	TP Load
Facility	Segment	(MGD)	(MGD)	(mg/l)	(lbs/yr)	(mg/l)	(lbs/yr)
HRSD-Boat Hbr.	600	25.00	16.00	11.0	536,045	1.00	48,706
HRSD-James R.	600	20.00	17.00	11.0	569,548	1.00	51,750
HRSD-W'msburg	600	22.50	15.00	11.0	502,542	1.00	45,662
Subtotal 600 =		67.50	48.00		1,608,135		146,117
HRSD-Nansemond	620	30.00	19.00	11.0	636,553	1.00	57,838
Subtotal 620 =		30.00	19.00		636,553		57,838
HRSD-Army Base	960	18.00	15.00	11.0	502,542	1.00	45,662
HRSD-VIP	960	40.00	32.00	11.0	1,072,090	1.00	97,411
J.H. Miles Seafood	960	--	0.32	30.0	29,223	1.00	974
Subtotal 960 =		58.0	47.32		1,603,855		144,047
HRSD-Ches/Eliz	965	24.00	19.00	26.4	1,526,409	1.88	108,674
Subtotal 295 =		24.00	19.00		1,526,409		108,674
Totals =		179.50	266.32		5,374,953		456,676

Cost estimates

The total costs to implement the tributary strategies for the Virginia portion of the Chesapeake Bay is $3.2 billion. The total for the James basin is $1.6 billion with $172 million in the upper, $1.1 billion in the middle and $365 million in the lower portion of the basin. These estimates include point sources, nonpoint sources and technical assistance costs to implement the nonpoint source reductions required.

Cost estimates are provided for both nonpoint and point sources for each of the tributary strategy basins. They are broken down according to source category in the bar graphs below. Tables in Appendix G provide a more detailed summary for each sub-basin. These tables show the number of BMPs and amount of point source reductions for each basin, but do not include the technical assistance costs included the cost estimates above.



Cost Estimates by Source Category

Nonpoint source costs

The nonpoint source costs are based on structural costs to implement BMPs for the source categories: agriculture, urban, mixed open, septic and forest. The cost estimates considered structural costs to implement BMPs, costs for services to implement BMPs such as nutrient management planning, septic pumping, etc., and materials and equipment usage costs to implement BMPs such as the agronomic practices for agriculture (i.e., cover crops, and conservation tillage). Technical assistance costs were also calculated and added to the BMP cost to obtain the total implementation costs. Maintenance costs were not included in the estimates.

The sources of information used to develop the cost estimates were as follows:

- Chesapeake Bay Program, Use Attainability Group Report, "Economic Analyses of Nutrients and Sediment Reduction Actions to Restore Chesapeake Bay Water Quality" (primary reference source). Urban BMP costs were taken from this source along with a small number of agricultural practices.

- Virginia's Agricultural Cost-Share Program Tracking Database, period of record was 1998-2002. Stream fencing practices were adjusted based on 2002 data.

- DCR's staff was consulted for nutrient management costs, erosion and sediment control costs, and the cost to transfer poultry litter.

- Study by Virginia Polytechnic Institute and State University and the United States Department of Agriculture was used for the forest harvesting practices.

The cost for the septic BMPs – connection to public sewer and septic tank pumping were based on information from nonpoint source implementation projects funded by DCR. Costs for the installation of a septic denitrification system was based on the assumption that most of the systems accounted for in the tributary strategy would be for new construction as compared to replacement of failing conventional on-site sewage disposal systems. The average cost figure for a denitrification system is $12,565 and the average cost for a conventional system is $4,500. The difference of $8,065 was used to calculate the cost for the advanced treatment to obtain the additional nitrogen removal per system.

Point source costs

The point source capital costs are planning level, order-of-magnitude figures (accurate from -30% to +50%), based on a combination of owner-furnished data and results from an estimation methodology developed by the Chesapeake Bay Program's Nutrient Reduction Technology (NRT) Workgroup. This Workgroup included state and federal staff, several treatment plant owners, academia, and two experienced and respected consulting engineering firms. More accurate figures can only be determined through specific facility planning, design, and ultimately construction bids for the necessary treatment upgrades.

The NRT methodology included assumptions about treatment types, plant sizes, and needed unit processes, to reduce nitrogen and phosphorus in order to meet three annual average discharge performance "tiers":

- Biological Nutrient Removal (BNR): TN = 8.0 mg/l; TP = 1.0 mg/l
- Enhanced Nutrient Removal (ENR): TN = 5.0 mg/l; TP = 0.5 mg/l
- Limit-of-Treatment (LOT): TN = 3.0 mg/l; TP = 0.1 mg/l

It is recognized that if a particular treatment level is chosen to meet a basin load allocation in the year 2010, it is probable that more stringent treatment will be needed to maintain the reduced load into the future. This is the case where a plant has not yet reached its design capacity in the year 2010, but must "cap" its discharge load as flows increase.

The point source cost estimates were developed using the "tier" that most closely matched the proposed level of treatment in each tributary strategy planning area. As a result, it is possible that the cost figures are under-estimated. This is due to the fact that some plant owners could chose to install a more stringent treatment process now, to maintain a "cap" load at the design capacity, rather than meeting an interim 2010 load goal and potentially face multiple construction projects to retrofit their plant. The most conservative cost estimate (i.e., highest cost, associated with limit-of-treatment technology) was used only for the municipal plants in the northern Virginia portion of the Potomac basin (excepting Upper Occoquan Sewage Authority), and municipal dischargers to the tidal-fresh portion of the Middle James basin (excepting Hopewell).
ble.

6-Year Timeline, Annual Implementation Levels and Technical Assistance for Nonpoint Sources.

Date (year)	Agriculture (%)	Urban (%)	Mixed Open (%)	Septic (%)	Forest (%)	Ag. TA (%)	Urban, MO TA (%)	Septic, Forest TA (%)
1	10	15	10	15	15	10	20	5
2	15	15	15	15	15	10	20	5
3	15	15	15	15	15	10	20	5
4	20	15	20	15	15	10	20	5
5	20	20	20	20	20	10	20	5
6	20	20	20	20	20	10	20	5

Provided in the table above is a level of implementation based on a projected percentage of the total BMPs by source category that would have to be implemented yearly to achieve the tributary strategies by 2010. These percentages were used to project the structural costs on an annual basis for each of the nonpoint source categories to implement the tributary strategies. Also, included in the table is factors (expressed as a percentage) used to estimate the technical assistance costs to implement the tributary strategies. The agricultural technical assistance costs was based on 10% of the structural cost, the urban and mixed open (MO) technical costs were based on 20% of the structural costs, and septic and forestry technical costs were based on 5% of the structural cost.

The technical assistance costs are based on a uniform percentage over the six year implementation period. The percentages of yearly implementation of BMPs were adjusted to account for the expectation that the implementation levels in the earlier years will not be as great as compared to the later years due to an initial time lag. This is anticipated as a result of putting into place more technical assistance, making programmatic and regulatory changes, improving implementation reporting and tracking efforts, and obtaining substantial amounts of funding.

Upper James River Basin							
	Imp Yr 1	Imp Yr 2	Imp Yr 3	Imp Yr 4	Imp Yr 5	Imp Yr 6	Totals
Agriculture BMPs	5.300	7.950	7.950	10.600	10.600	10.600	53.002
Urban BMPs	4.622	4.622	4.622	4.622	6.162	6.162	30.810
Mixed Open BMPs	3.161	4.741	4.741	6.322	6.322	6.322	31.608
Septic BMPs	2.354	2.354	2.354	2.354	3.139	3.139	15.696
Forest BMPs	0.004	0.004	0.004	0.004	0.006	0.006	0.030
Agriculture TA $	0.530	0.795	0.795	1.060	1.060	1.060	5.300
Urban & Mixed Open TA $	1.557	1.873	1.873	2.189	2.497	2.497	12.484
Septic & Forest TA $	0.118	0.118	0.118	0.118	0.157	0.157	0.786
Total Basin Estimated NPS Cost including Technical Assistance							149.715

* Cost in Millions of Dollars

Middle James River Basin							
	Imp Yr 1	Imp Yr 2	Imp Yr 3	Imp Yr 4	Imp Yr 5	Imp Yr 6	Totals
Agriculture BMPs	9.100	13.650	13.650	18.200	18.200	18.200	90.999
Urban BMPs	69.066	69.066	69.066	69.066	92.088	92.088	460.441
Mixed Open BMPs	7.657	11.486	11.486	15.315	15.315	15.315	76.573
Septic BMPs	16.048	16.048	16.048	16.048	21.397	21.397	106.985
Forest BMPs	0.023	0.023	0.023	0.023	0.030	0.030	0.153
Agriculture TA $	0.910	1.365	1.365	1.820	1.820	1.820	9.100
Urban & Mixed Open TA $	15.345	16.110	16.110	16.876	21.481	21.481	107.403
Septic & Forest TA $	0.804	0.804	0.804	0.804	1.071	1.071	5.357
Total Basin Estimated NPS Cost including Technical Assistance							857.011

* Cost in Millions of Dollars

Lower James River Basin							
	Imp Yr 1	Imp Yr 2	Imp Yr 3	Imp Yr 4	Imp Yr 5	Imp Yr 6	Totals
Agriculture BMPs	0.873	1.309	1.309	1.756	1.756	1.756	8.729
Urban BMPs	17.906	17.906	17.906	17.906	23.874	23.874	119.371
Mixed Open BMPs	0.373	0.559	0.559	0.745	0.745	0.745	3.725
Septic BMPs	5.131	5.131	5.131	5.131	6.841	6.841	34.204
Forest BMPs	0.003	0.003	0.003	0.003	0.004	0.004	0.020
Agriculture TA $	0.087	0.131	0.131	0.176	0.176	0.176	0.873
Urban & Mixed Open TA $	3.656	3.693	3.693	3.730	4.924	4.924	24.619
Septic & Forest TA $	0.257	0.257	0.257	0.257	0.342	0.342	1.711
Total Basin Estimated NPS Cost including Technical Assistance							193.253

* Cost in Millions of Dollars

Building on Accomplishments

The Chesapeake Bay Program has tracked nitrogen, phosphorus, and sediment loads in Virginia by major land use for approximately twenty years. Based on collected data, state and local agencies can monitor the progress of nonpoint and point source pollution reduction programs and initiatives. The following pie charts provide an overview of the percent of total nitrogen, phosphorus, and sediment loads by land use for the years 1985, and 2002 for each of the sub-watershed basins. Two of the land uses, agricultural and urban, expand to include hay, high-till, low-till, manure, and pasture, and impervious and impervious cover, respectively.

Agriculture showed the greatest reduction in nitrogen and sediment loads of eight and nine percent, respectively. There was an increase of two percent for phosphorus. On the other hand, forest land use loads increased for all three pollutant categories. Nitrogen levels increased by

Upper James

The Upper James load-by-land use charts display the majority of nitrogen loading as a result of agricultural land uses in the Upper James with 43 percent. This percentage decreased by 11 percent since 1985. The second largest contributor is point sources, comprising 35 percent of the load. Urban was third with eight percent, and forest was fourth with three percent. Both urban and forest land uses decreased by four and one percent, respectively, from 1985 levels.

Phosphorus in the Upper James is dominated by forest land uses, comprising 35 percent of the load. Agriculture is not far behind with 32 percent (down four percent from 1985) and point sources are third with 15 percent. Urban, mixed open, and atmospheric deposition make up the remaining 16 percent of the load.

The majority of sediment loads in the Upper James are a close split between forest and agricultural land uses. Forest land uses comprise 47 percent of the sediment load while agriculture is a close 41 percent. The remaining lands uses of mixed open and urban each comprise six percent of the total sediment load to the watershed.

Middle James

Point sources are the main contributor of nitrogen loads to the Middle James, as displayed in the Middle James land use loading charts. Although point sources comprise over one-third of the load (35 percent), it is important to understand that this percentage is 10 percent less than it was in 1985. The second largest contributor is agriculture with 22 percent. Agricultural loads have held constant at 22 percent since 1985. Urban land uses, with 16 percent (up four percent from 1985) are third in nitrogen loads followed by forest land uses with 13 percent of the load. Mixed open, septic, and atmospheric deposition comprise the remaining fourteen percent of nitrogen loads to the Middle James.

Agricultural land uses are the main source for phosphorus in the Middle James, with 37 percent of the total load. This percentage has increased nine percent since 1985. The second largest contributor, point sources, makes up 22 percent of the load. This is a decrease of 21 percent since 1985. Urban and mixed open are in third and fourth place for phosphorus loadings, with 20 and 18 percent, respectively. The remaining three percent are a combination of forest land uses and atmospheric deposition.

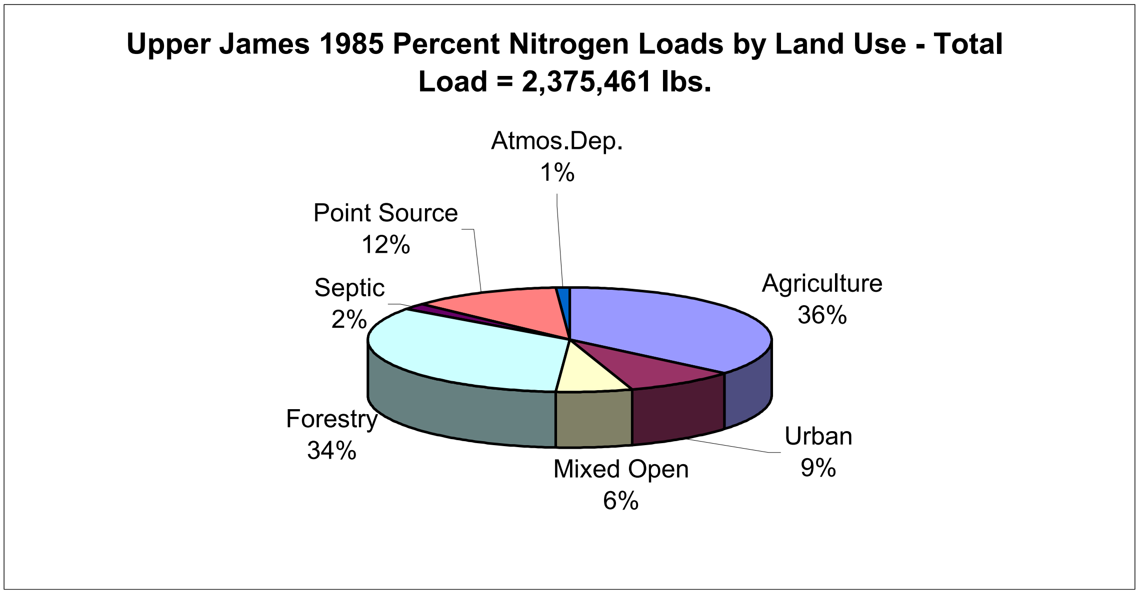
Agriculture is the primary source of sediment loading in the Middle James watershed, with 43 percent of the total load. This is a decrease of nine percent since the1985 data were calculated. Forestry was the second largest contributor, with 30 percent, and urban and mixed open were third and fourth with 14 and 13 percent of the load, respectively.

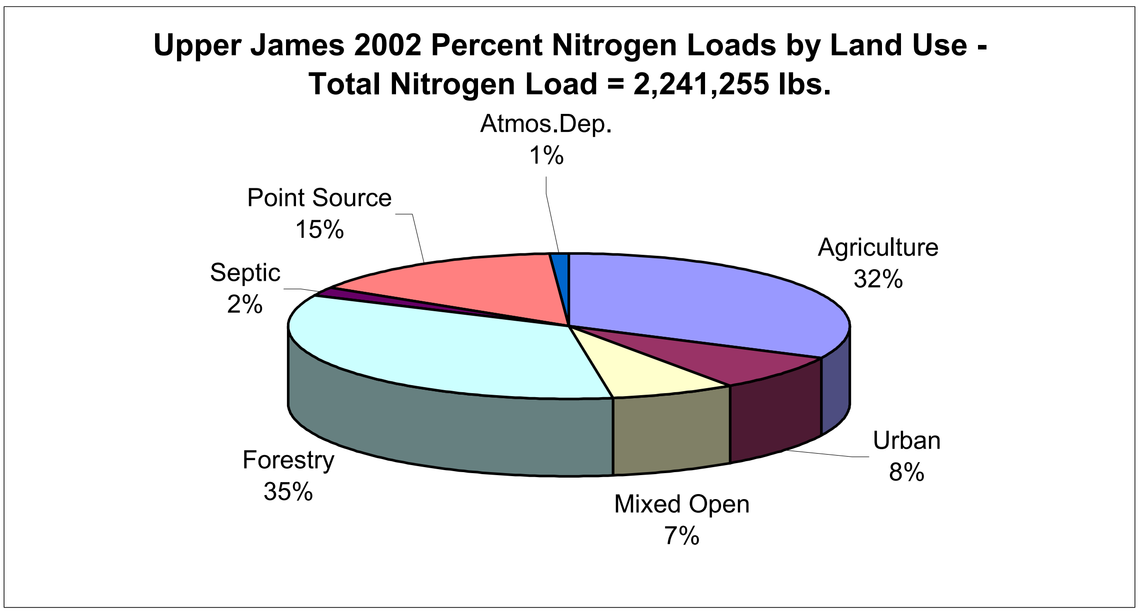
Lower James

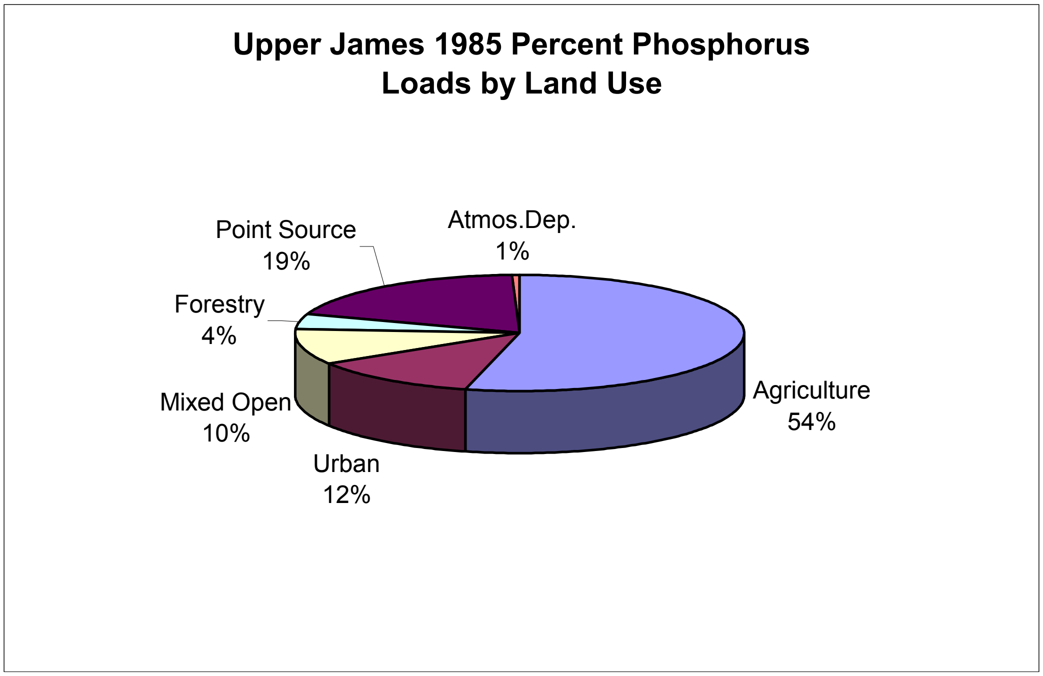
According to the Lower James land use loading charts the majority of nitrogen loads in the Lower James watershed are a result of point source facilities. Approximately 53 percent of the load comes from point sources, although that figure has decreased from 1985 by ten percent. The second highest contributor is urban (pervious), with 17 percent of the load. This percentage increased by four percent from 1985 levels. Agricultural land uses are third highest with 13 percent, a slight increase of two percent from 1985. Other land uses, atmospheric deposition, mixed open, forest, and septic make up less than three percent of the nitrogen load.

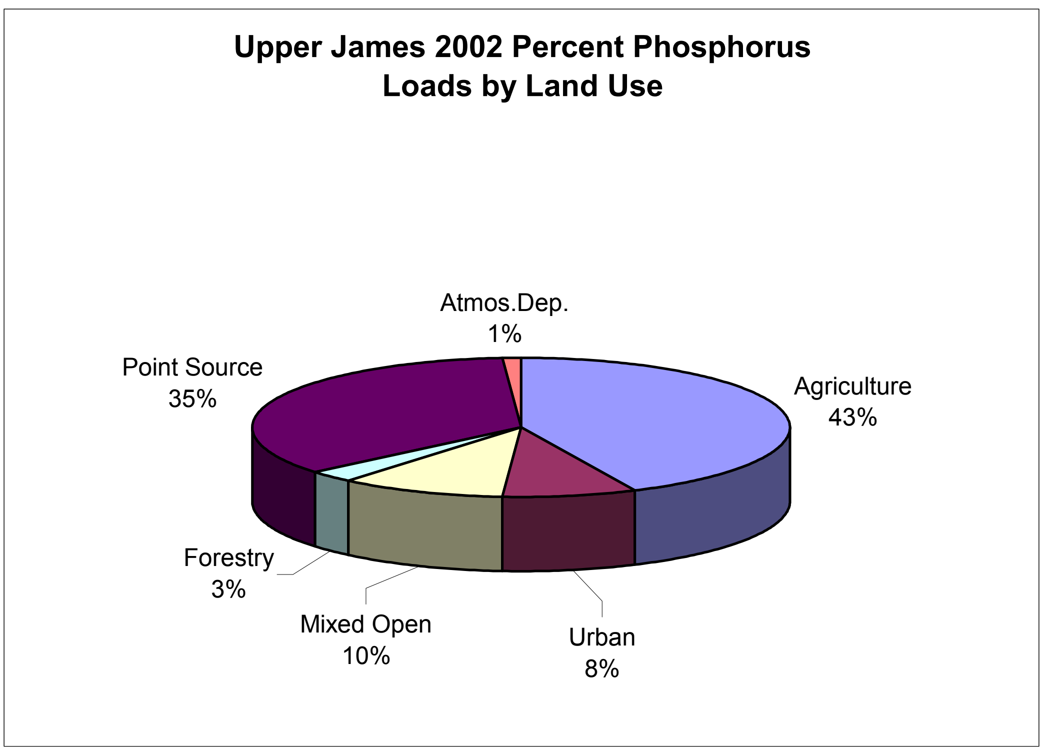
Phosphorus loads in the Lower James are also dominated by point sources at 42 percent. It is important to recognize that this percentage decreased by 27 percent since 1985. The second largest contributor to date is urban (pervious) with 31 percent. This percentage is an increase of 13 percent over 1985 levels. Agriculture comprises the third highest load for phosphorus with 16 percent. The percentage for agricultural land uses increased by eight percent.

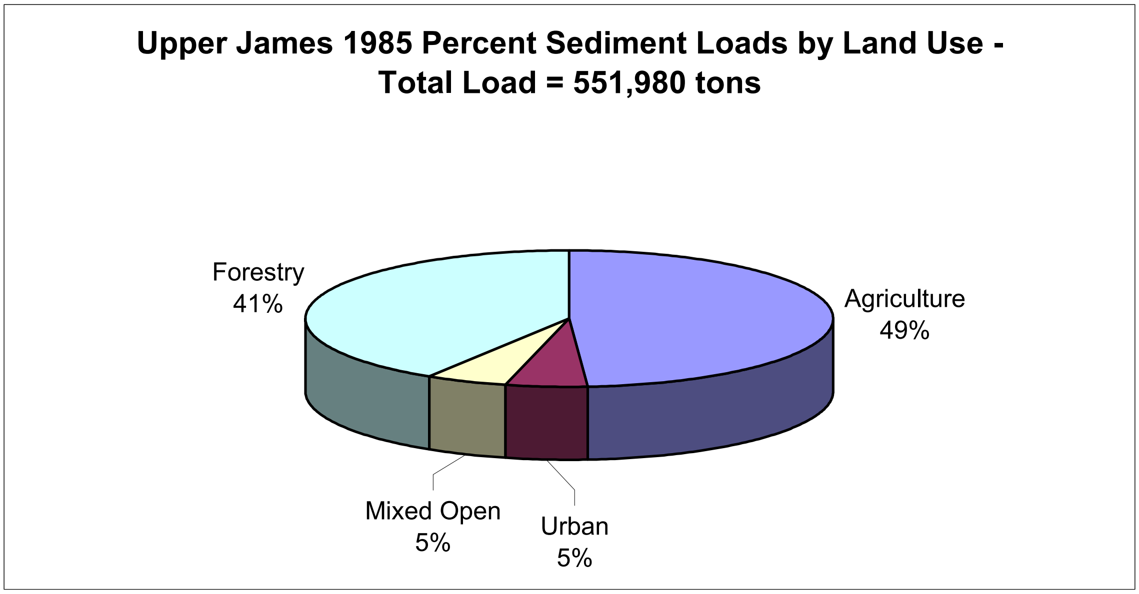
Agricultural land uses are the most significant contributor for sediment loads in the Lower James watershed with 67 percent. This percentage has remained consistent since 1985. The second largest contributor is urban (pervious) with 18 percent, and third is forest with 11 percent.

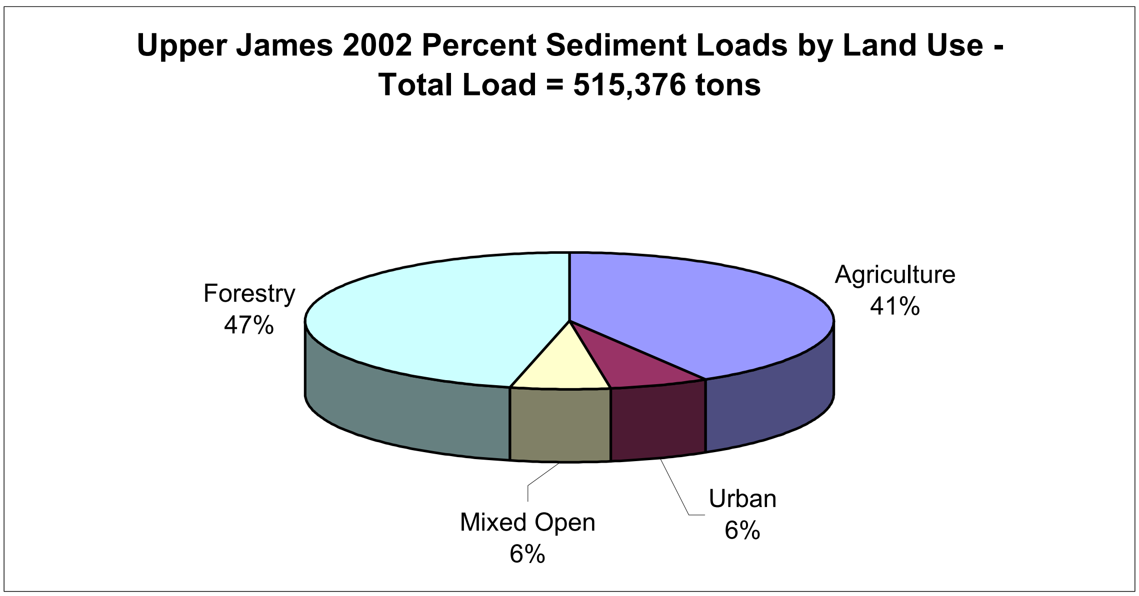

Upper James 1985 Percent Nitrogen Loads by Land Use - Total Load = 2,375,461 lbs.
Atmos.Dep. 1%
Point Source 12%
Septic 2%
Agriculture 36%
Forestry 34%
Urban 9%
Mixed Open 6%

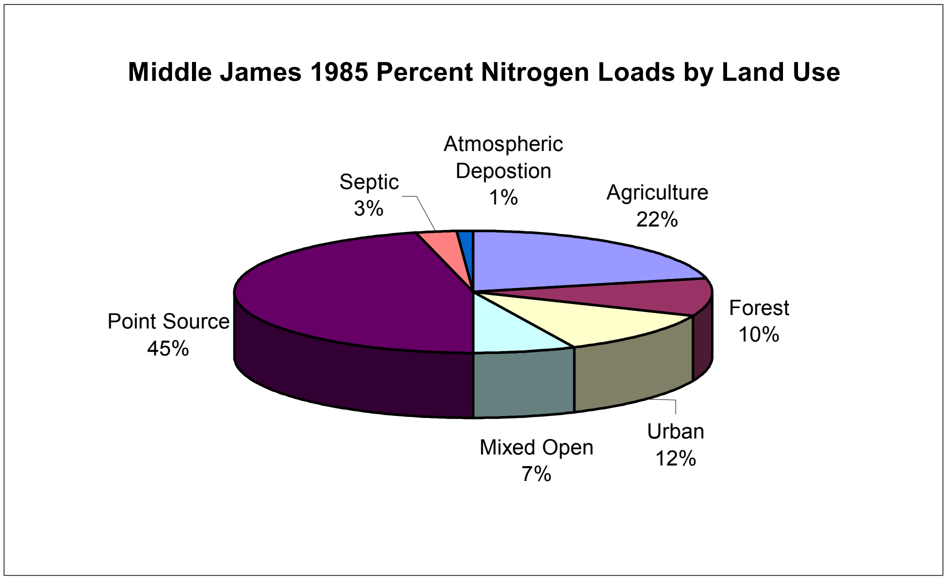

Upper James 2002 Percent Nitrogen Loads by Land Use - Total Nitrogen Load = 2,241,255 lbs.
Atmos.Dep. 1%
Point Source 15%
Agriculture 32%
Septic 2%
Urban 8%
Forestry 35%
Mixed Open 7%

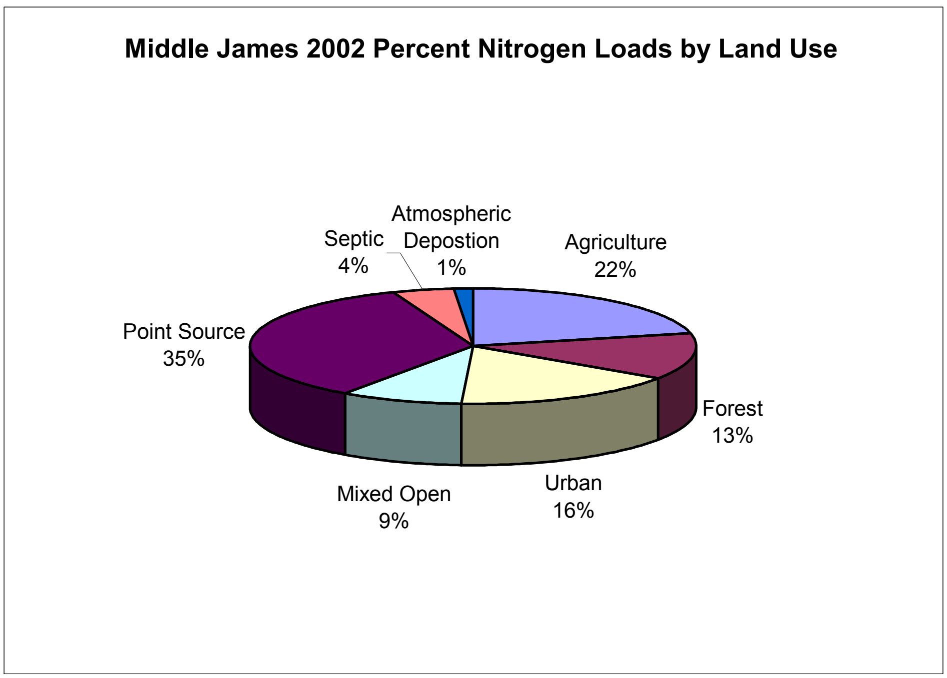

Upper James 1985 Percent Phosphorus
Loads by Land Use
Point Source
19%
Atmos.Dep.
1%
Forestry
4%
Mixed Open
10%
Urban
12%
Agriculture
54%

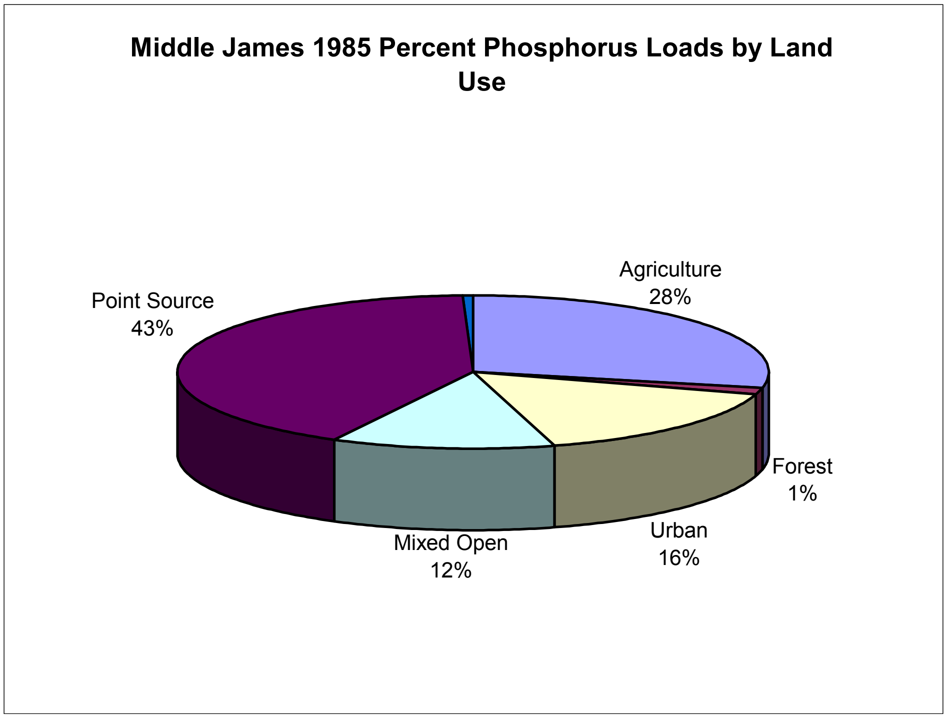

Upper James 2002 Percent Phosphorus
Loads by Land Use
Atmos.Dep.
1%
Point Source
35%
Agriculture
43%
Forestry
3%
Mixed Open
10%
Urban
8%

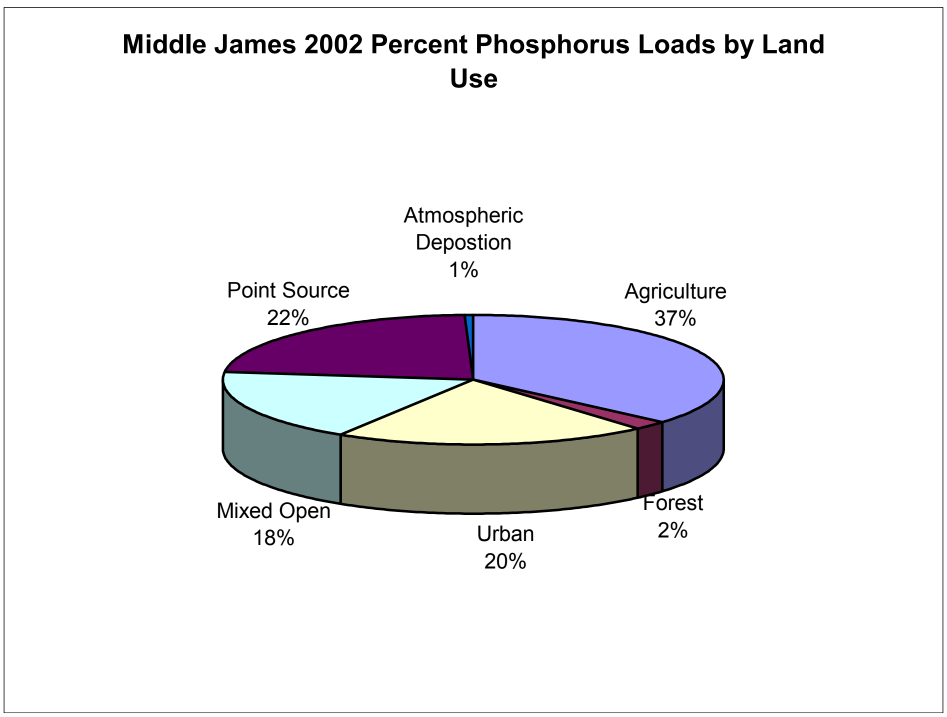

Upper James 1985 Percent Sediment Loads by Land Use -
Total Load = 551,980 tons
Forestry
41%
Agriculture
49%
Mixed Open
5%
Urban
5%

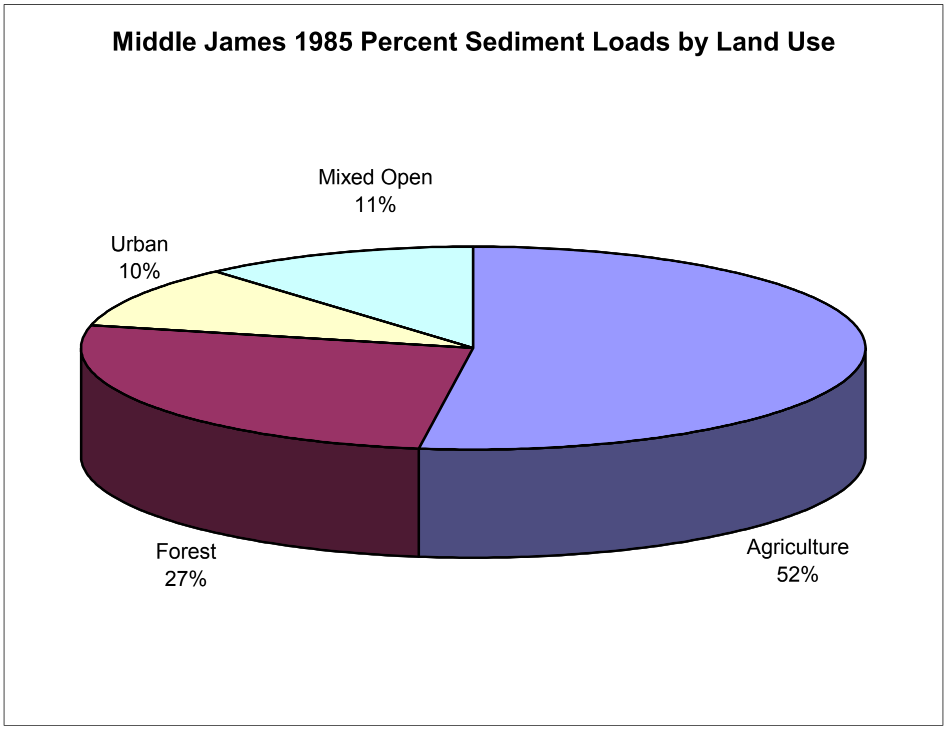

Upper James 2002 Percent Sediment Loads by Land Use -
Total Load = 515,376 tons
Forestry
47%
Agriculture
41%
Mixed Open
6%
Urban
6%


Middle James 1985 Percent Nitrogen Loads by Land Use
Atmospheric Depostion 1%
Septic 3%
Agriculture 22%
Forest 10%
Point Source 45%
Urban 12%
Mixed Open 7%

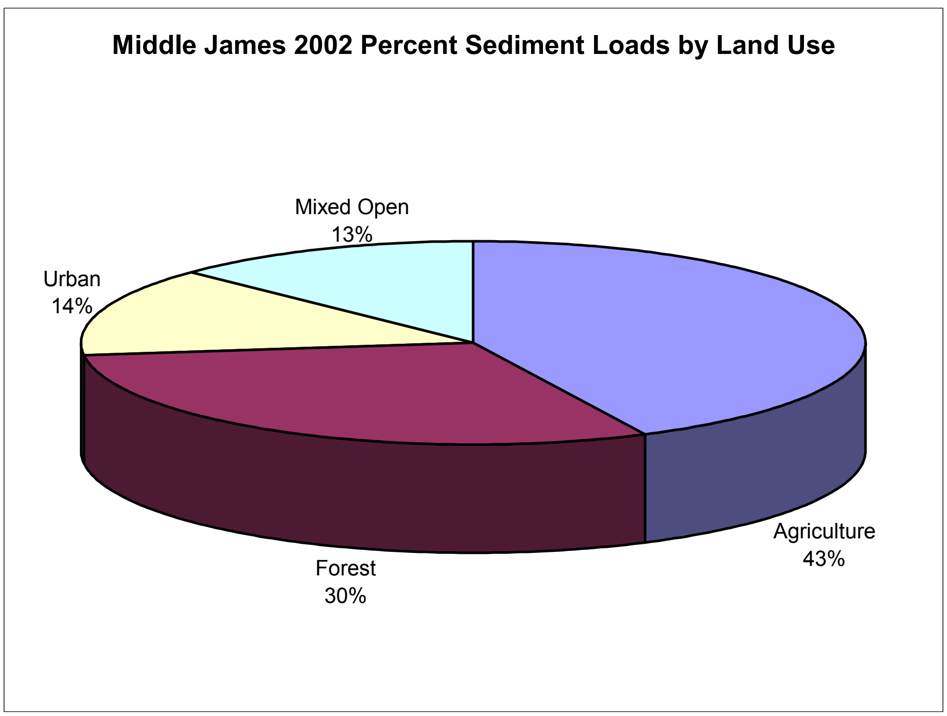

Middle James 2002 Percent Nitrogen Loads by Land Use
Atmospheric Depostion 1%
Septic 4%
Agriculture 22%
Point Source 35%
Forest 13%
Urban 16%
Mixed Open 9%


Middle James 1985 Percent Phosphorus Loads by Land Use
Agriculture 28%
Point Source 43%
Forest 1%
Urban 16%
Mixed Open 12%

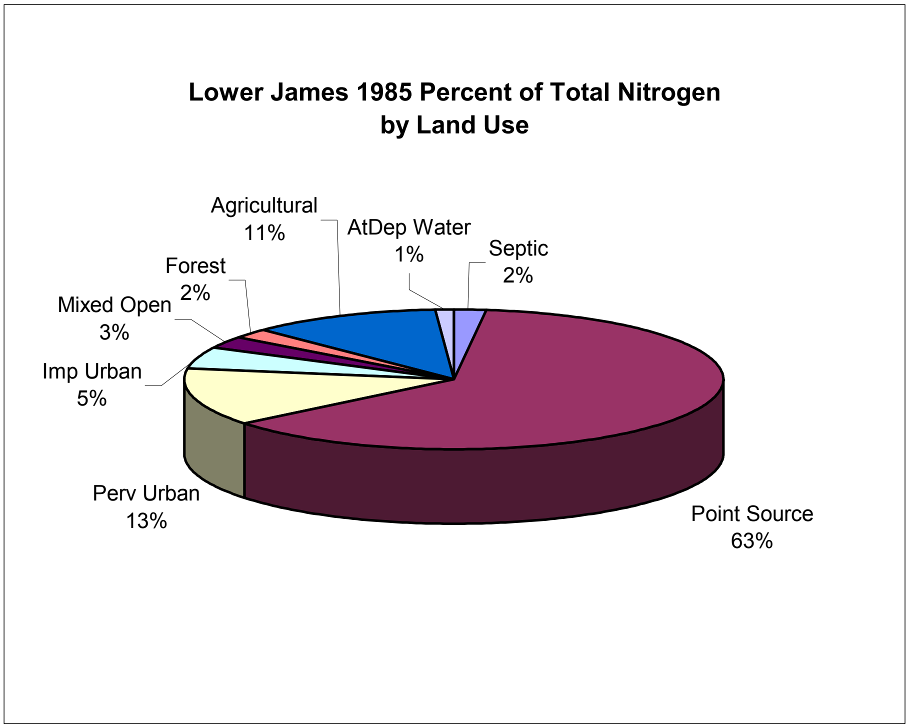

Middle James 2002 Percent Phosphorus Loads by Land Use
Atmospheric Depostion 1%
Point Source 22%
Agriculture 37%
Mixed Open 18%
Forest 2%
Urban 20%

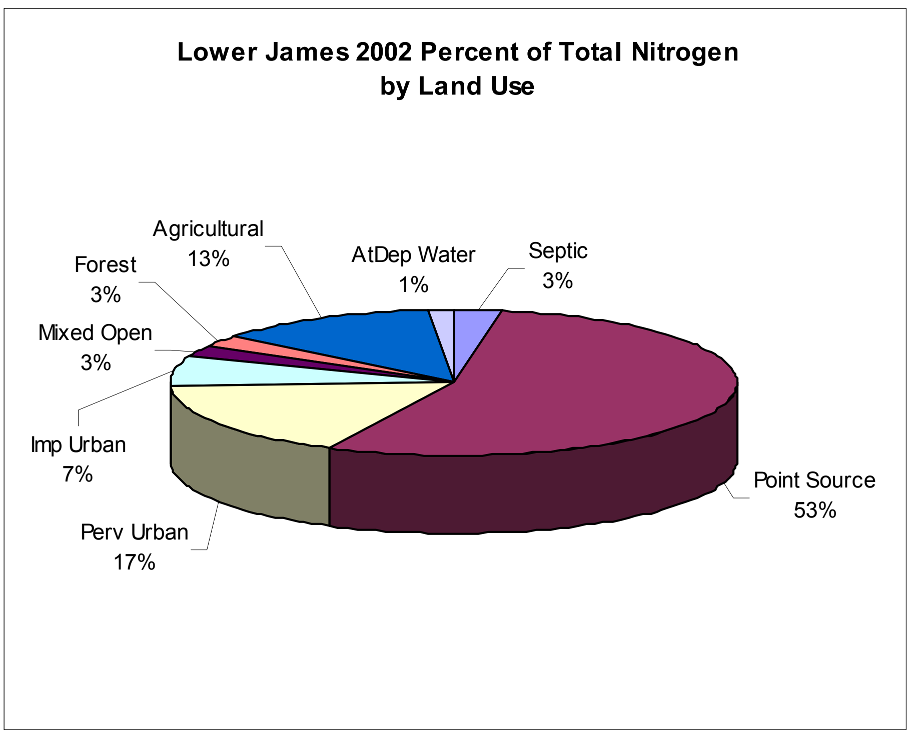


Middle James 1985 Percent Sediment Loads by Land Use
Mixed Open
11%
Urban
10%
Forest
27%
Agriculture
52%

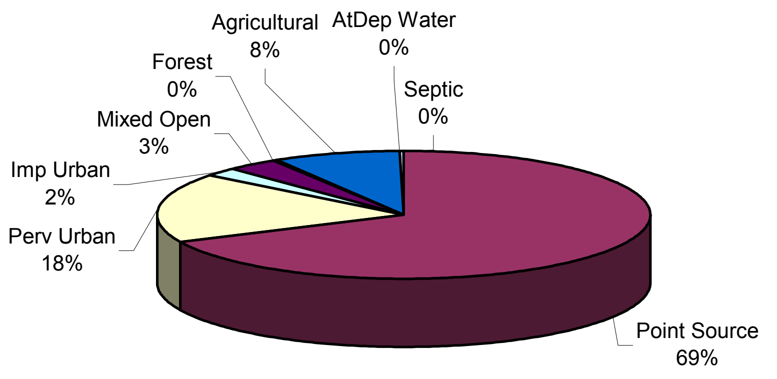


Middle James 2002 Percent Sediment Loads by Land Use
Mixed Open
13%
Urban
14%
Forest
30%
Agriculture
43%

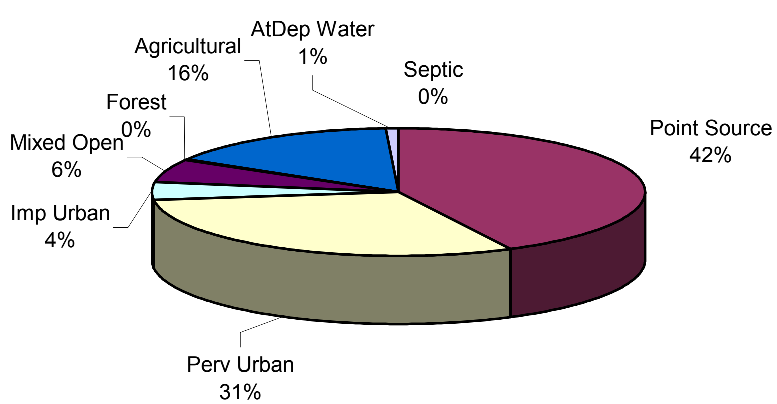

Lower James 1985 Percent of Total Nitrogen
by Land Use
Agricultural
11%
AtDep Water
1%
Septic
2%
Forest
2%
Mixed Open
3%
Imp Urban
5%
Perv Urban
13%
Point Source
63%

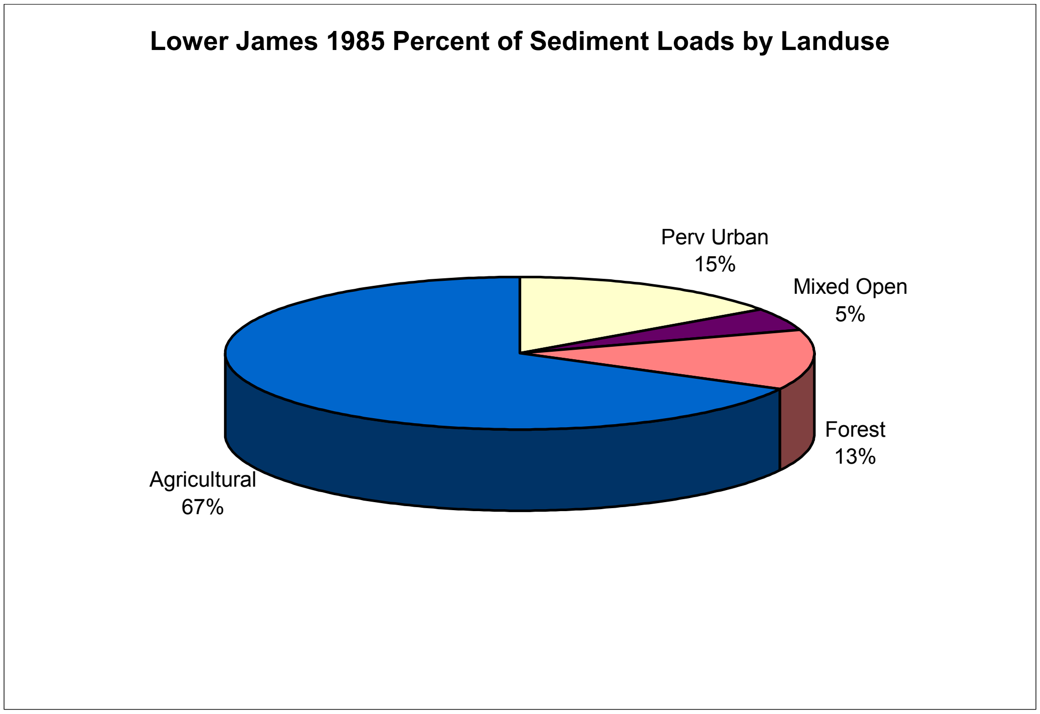

Lower James 2002 Percent of Total Nitrogen
by Land Use
Agricultural
13%
AtDep Water
1%
Septic
3%
Forest
3%
Mixed Open
3%
Imp Urban
7%
Perv Urban
17%
Point Source
53%

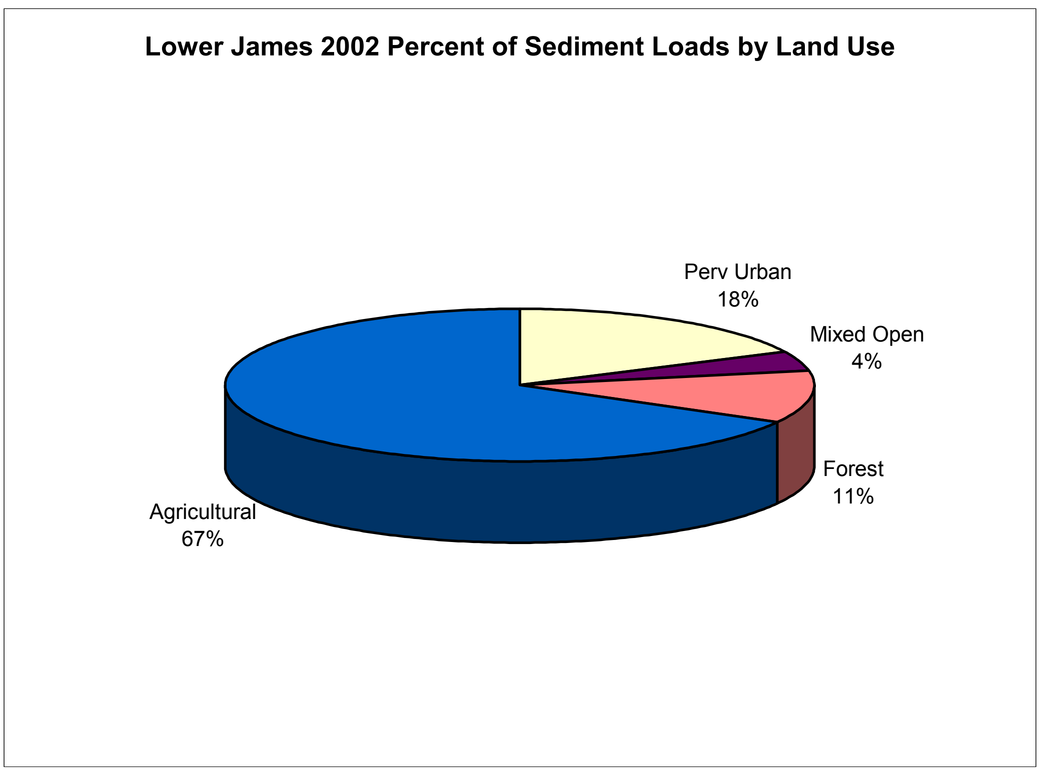
Lower James 1985 Percent of Total Phosphorus by Land Use



Lower James 2002 Percent of Total Phosphorus by Land Use




Lower James 1985 Percent of Sediment Loads by Landuse
Perv Urban
15%
Mixed Open
5%
Forest
13%
Agricultural
67%


Lower James 2002 Percent of Sediment Loads by Land Use
Perv Urban
18%
Mixed Open
4%
Forest
11%
Agricultural
67%

Progress to date (Nonpoint source BMPs and CREP)

The Department of Conservation and Recreation (DCR) tracks all best management practices (BMPs) and Conservation Reserve Enhancement Program (CREP) practices that receive funding through the Virginia Agricultural Best Management Practices Cost-Share Program. This program is administered by the 47 Soil and Water Conservation Districts (SWCD) state-wide. Funds provided assist farmers with the cost of installing conservation practices that protect water as well as enhance productivity by conserving soil and making wise use of other farm resources. Soil and Water Conservation Districts working within the James River watershed include: Blue Ridge, Headwaters, Mountain, Mountain Castles, Natural Bridge, and Skyline in the Upper James basin; Appomattox River, Culpeper, Hanover-Caroline, Henricopolis, James River, Monacan, Peaks of Otter, Peter Francisco, Piedmont, Robert E. Lee, and Thomas Jefferson in the Middle James basin; and, Colonial, Peanut, and Virginia Dare in the Lower James River basin.

Since the Virginia Agricultural Best Management Practices Cost-Share Program began, more than 5,500 BMPs have been installed in the James watershed providing a conservation benefit to approximately 114,000 acres of land. The CREP land management program has also played a major role in improving water quality of the James River and its tributaries. The program’s rental and cost-share payments help farmers restore riparian buffers, grass filter strips and wetlands. All CREP-enrolled pasture or cropland are planted with hardwood trees or native warm season grasses. Also administered by SWCDs, more than 750 CREP practices have been installed in the James River watershed, providing conservation benefits to approximately 23,000 acres.
Table 9 displays the breakdown of BMP and CREP implementation based on Chesapeake Bay model segments in the James River watershed. Note the acreage for each segment is based on the whole segment and does not pertain specifically to agricultural lands. **Map 2** displays the distribution of agricultural best management practices and CREP projects through October 2003.

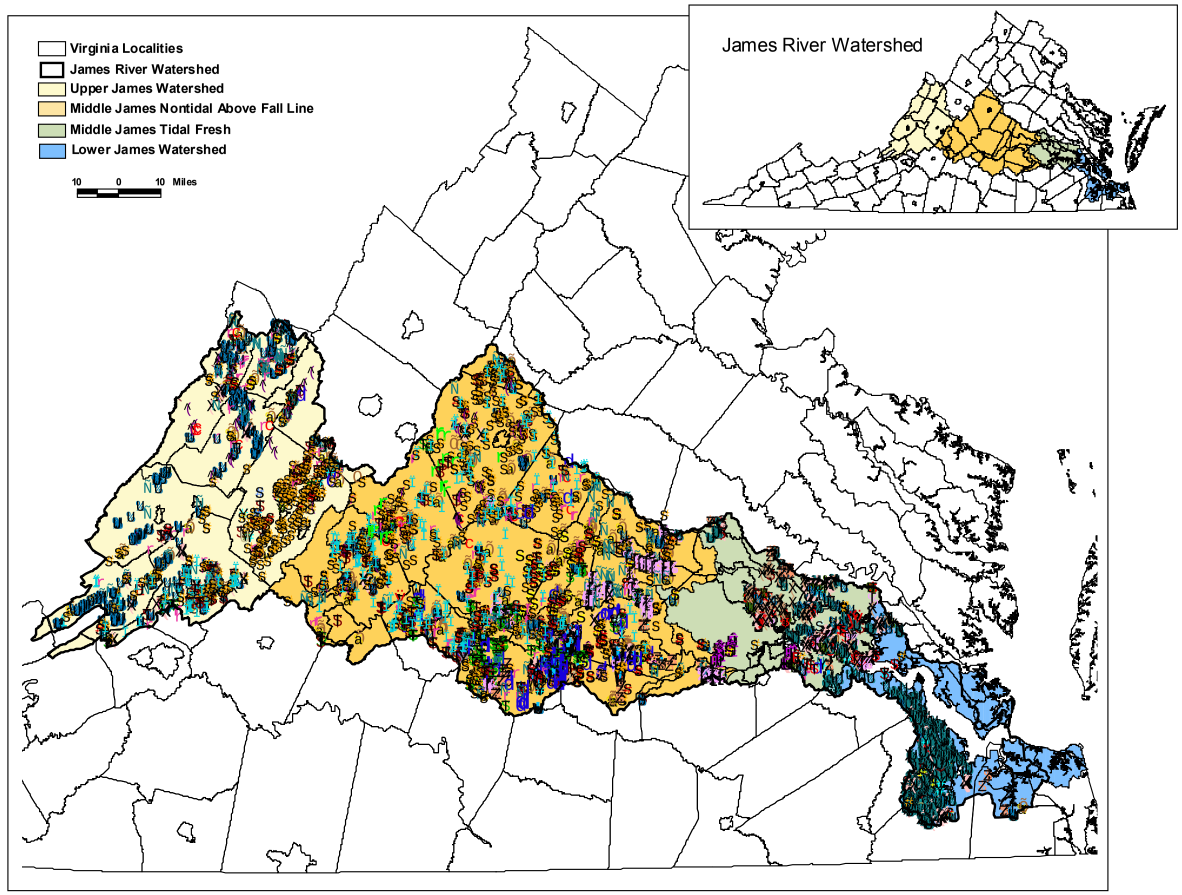
James River Best Management Practices* & Conservation Reserve Enhancement Program Practices 1988 through 2003

CREP Practices & Number of Systems

- Filter Strip (Rental) (11)
- Riparian Forest Buffer (Rental) (235)
- Riparian Forest Buffer (213)

James Watershed Best Management Practices & Number of Systems

- Reforestation of Erodible Crop & Pasture Land (214)
- Woodland Buffer Filter Area (20)
- Woodland Erosion Stabilization (94)
- Nutrient Management Plan Writing (16)
- Sidedress Application of Nitrogen on Corn (23)
- Manure App to Corn (Using N test to Determine Sidedress N Need) (1)
- Late Winter Split Application of Nitrogen on Small Grain (43)
- Permanent Vegetative Cover on Cropland (620)
- Permanent Vegetative Cover on Critical Areas (172)
- Farm Rd/Heavy Traffic Animal Travel Lane Stabilization (1)
- SL-15 (512)
- Continuous No-Till System (53)
- Permanent Vegetative Cover on Cropland Wildlife Option (5)
- Stripcropping System (162)
- Buffer Stripcropping (123)
- Diversion (5)
- Grazing Land Protection (828)
- Alternative Water System (216)
- Protective Cover for Specialty Crops (144)
- Small Grain Cover Crop for Nutrient Management (1,390)
- Field Borders/Wildlife Option (8)
- Idle Land/Wildlife Option (9)
- Fescue Conversion/Wildlife Option (15)
- Sediment Retention, Erosion or Water Control Structures (26)
- Stream Protection (120)
- Streambank Stabilization (15)
- Stream Crossings & Hardened Access (1)
- Sod Waterway (140)
- Animal Waste Control Facility (160)
- Loafing Lot Management System (10)
- Composter Facility (56)
- Soil Test in Support of Nutrient Management Plan (28)
- Animal Waste Structure Pumping Equipment (1)
- Ag Chemical & Fertilizer Handling Facility (1)
- Grass Filter Strips (9)
- Integrated Pest Management (52)
- WQ-3 (9)
- Legume Cover Crop (259)



February 2004

* Refers to BMPs tracked through Department of Conservation & Recreation Cost Share Incentive Program.

Produced by:
Virginia Department of Conservation & Recreation
James Watershed Office

Data Source:
Department of Conservation & Recreation

Table 9. DCR Incentives Tracing Program Best Management Practices and Conservation Reserve Enhancement Program implementation.

Segment	TotalSegAcres	BMPAcresBenefit	%SegBMP	CREPAcresBenefit	%SegCREP	TotalAcresBen
Upper James						
Seg 265	221,198	1,860	0.84%	10,083	4.56%	11,943
Seg 270 (Upper)	1,690,732	23,694	1.40%	2,661	0.16%	26,355
Subtotal	*1,911,930*	*25,554*	*1.34%*	*12,744*	*0.67%*	*38,298*
Middle James						
Seg 270 (Middle)	131,208	300	0.23%	0	0.00%	300
Seg 280	1,921,280	33,678	1.75%	4,214	0.22%	37,892
Seg 290	321,272	1,951	0.61%	1,059	0.33%	3,010
Seg 300	766,901	11,159	1.46%	4,752	0.62%	15,911
Seg 310	92,408	910	0.98%	33	0.04%	943
Seg 600 (Middle)	565,238	15,127	2.68%	13	0.01%	15,140
Seg 610	160,228	2,467	1.54%	0	0.00%	2,467
Subtotal	*3,958,535*	*65,592*	*1.66%*	*10,071*	*0.25%*	*75,663*
Lower James						
Seg 600 (Lower)	275,811	8,562	3.10%	129	0.05%	8,691
Seg 620	137,078	14,353	10.47%	0	0.00%	14,353
Seg 630	20,691	66	0.32%	0	0.00%	66
Seg 950	24,533	0	0.00%	0	0.00%	0
Seg 955	35,008	0	0.00%	0	0.00%	0
Seg 960	89,385	127	0.14%	3	0.00%	130
Seg 965	55,308	0	0.00%	0	0.00%	0
Subtotal	*637,814*	*23,108*	*3.62%*	*132*	*0.02%*	*23,240*
Total:	6,508,279	114,254	1.76%	22,947	0.35%	137,201

Data Source: Virginia Department of Conservation & Recreation, James River Watershed Soil & Water Conservation Districts, & Chesapeake Bay Program

Agriculture is not the only focus for best management practice implementation. Soil and Water Conservation Districts across the watershed are increasingly involved in promoting and assisting with urban BMP installation as agricultural and forest lands are rapidly converted to residential and commercial uses. Such landuse conversions result in substantial increases in impervious surfaces, thus increasing stress on existing stormwater management systems and, ultimately, the James River and its tributaries. Examples of urban best management practices include street sweeping, urban nutrient management, stormwater retrofitting, etc. Although funding for the DCR Cost Share program is exclusively for agricultural practices, legislative action is underway to encourage the Virginia General Assembly to fund urban practices.

IV. Implementing the Strategies:
A Message from the Secretary of Natural Resources

This strategy and similar strategies prepared for Virginia's Chesapeake Bay tributaries propose a suite of nonpoint source best management practices, sewage treatment plant upgrades and other actions necessary to achieve the specified nutrient and sediment reductions. The analysis and practices contained in this strategy are an important first step and bring together state and regional goals informed by an understanding of local conditions as developed by the tributary teams. However, as the input decks outlined in the previous section of this document make clear, achieving the necessary implementation levels go far beyond what we have previously seen. In order for these strategies to be meaningful, we must identify what additional resources and tools are necessary to achieve and cap these nutrient reductions in the timeframe called for by the Chesapeake 2000 Agreement. We must also further refine these strategies with specific information regarding implementation budgets and timetables.

The citizens of Virginia should receive this clear message. Restoration of the Chesapeake Bay is possible but it will not come without substantial public and private resources and programs that ensure that management practices are adopted and maintained. Without such actions, the promises we have made have no meaning. Without such actions, the economic and environmental benefits of a restored bay will not be realized.

The tributary teams have raised a variety of issues regarding implementation, tracking and cost and those questions need to be addressed as we move forward. The purpose of this chapter is to build on those issues and outline in broad terms the implementation approach for these strategies. During the public comment period and beyond, the public is invited to offer comments and provide guidance on the issues and questions that follow.

Funding

Part Three of this strategy outlines the magnitude of funding necessary to address the various sources of nutrient and sediments. It is clear that implementation of these strategies will require financial resources that are far beyond those currently available. Governor Warner has proposed a dedicated source of funds for water quality improvement and land conservation, however the current stalemate in the state budget process has put the Governor's proposal as well as funds proposed by the Senate in doubt.

There is also activity at the regional level. The Chesapeake Executive Council has appointed a high level panel to address funding issues. Chaired by former Virginia Governor Gerald Baliles, the panel has begun its deliberations is expected to release its findings and recommendations in October 2004.

As part of its review of this and the other strategies, the public is invited to address the funding issue with suggestions on how additional funding can be obtained to implement this strategy. In the meantime, efforts to target existing resources will be pursued. These strategies provide the basis for evaluating the areas with greatest need.

Point source implementation

Implementation of point source reductions will be accomplished through completion of sewage treatment plant upgrades currently underway as well as final adoption of regulatory programs that are currently being developed by the Department of Environmental Quality.

Regulatory Programs Now Under Development

As described previously in this document, the EPA Chesapeake Bay Program Office published water quality criteria related to dissolved oxygen, water clarity and chlorophyll "a" that will serve as the basis for the revision of water quality standards for the states in the Chesapeake Bay watershed with tidal waters (Maryland and Virginia). The criteria, when achieved, will provide the habitat necessary to protect the bay's fish, shellfish, crabs and other living resources. A notice of intended regulatory action (NOIRA), the first step in the regulatory process to amend water quality standards, was published in the Virginia Register on November 17, 2003. The regulatory process prescribed by the Virginia Administrative Process Act is now underway. The public comment process on the proposed revisions to the standards should take place later this year.

In December 2003, Governor Warner announced the beginning of a regulatory process to establish a range of technology-based nutrient limits in discharge permits within the Chesapeake Bay watershed. The regulation will complement the water quality standards regulation and ensure that the nutrient reductions will occur. A NOIRA for this rulemaking has been published in the Virginia register and the regulatory process has begun.

These concurrent rulemakings will ensure that Virginia has the regulatory tools that define the water quality goals we are committed to achieving for the Chesapeake Bay and its tidal rivers and will serve as the basis for implementation of these strategies.

Accommodating Future Growth

The pollutant loads assigned to point and non point sources must be capped over time. The capacity of existing sewage treatment plants to handle future growth in their communities needs to be assured while at the same time not exceeding the load allocation caps for those particular plants or for an entire river basin. In addition, even if the point source regulation requires that all new plants must achieve limit of technology (LOT) treatment, there is a new load associated with even a LOT facility. Therefore, how can new or expanded treatment plants be accommodated?

Nonpoint source implementation

Nonpoint sources account for the majority of nutrients flowing into the Chesapeake Bay system and at the same time, because of their diffuse nature, they are the most difficult to control. There has been some success in addressing nonpoint sources, but the kind of comprehensive implementation necessary to improve water quality remains elusive. While existing programs, including cost-share programs on agricultural land and the Commonwealth's newly reorganized and expanded stormwater management law, will be brought to bear on nutrient and sediment pollution, better use of existing authorities and an examination of what mix of regulatory and voluntary programs are necessary must begin.

Comprehensive Management of Nutrients and Sediments on Land

The strategies rely heavily on adoption and implementation of nutrient management plans on both agricultural and urban lands. How can consistent and comprehensive application of nutrient management plans on both agricultural and urban lands be achieved?

Are there improvements that can be made to current agriculture nonpoint source control programs to better address nutrient issues? For example, nutrient management plans are currently required by poultry operations that use waste on their own lands. However, nutrient management plans are not required for those who use waste generated on other farms. How should this discrepancy be addressed?

Septic systems are currently an uncontrolled source of nitrogen. Should all newly installed septic systems and replacement systems be required incorporate processes to remove nitrogen from effluent?

Beneficial uses of animal and poultry waste must be more aggressively pursued. Value added products produced from animal or poultry waste or "waste to energy" facilities can help address nutrient issues. How can these approaches be broadly implemented in Virginia?

Buffers along streams and rivers have proven to be an effective practice to reduce nutrients and sediments. In addition to programs such as the Conservation Reserve Enhancement Program that establish buffers on agricultural lands, programs such as the Chesapeake Bay Preservation Act require buffers along perennial streams in Eastern Virginia. What can be done to accelerate the establishment of buffers along Virginia's streams and rivers?

The placement of sewage sludge (sometimes called "bio-solids") on agricultural lands is increasing. Are programs currently in place sufficient to address the impacts of this source of nutrients?

Land use

As these strategies recognize, the landscape is changing. Growth and development will alter the ratio of sources and conversions from less intensive land uses to more intensive uses will continue. These strategies recognize that new methods of land management, particularly low impact development practices, will need to be employed on a much larger scale. This approach must be pursued concurrently with improved enforcement of erosion and sediment control and other traditional land management practices.

How can these news land management practices become integral parts of local land use and land management programs particularly in areas outside those governed by the Chesapeake Bay Preservation Act?

Next steps

Although considerable efforts have gone into the development of this strategy, it is not complete. While we have identified the point and nonpoint source practices necessary to achieve our goals, a good deal of work with regard to the implementation of these practices remains to be done. Following the public comment period, these strategies will be supplemented with additional detail regarding implementation responsibilities, budgets and timetables. We must clearly show how each of the practices proposed can be implemented; first, by showing what existing programs can accomplish with known resources and second by showing what additional resources will be necessary to complete implementation. In addition, detailed progress reports will be made annually to the Governor, the General Assembly and the citizens of Virginia as part of the required annual report on Tributary Strategy implementation.

As the implementation of the strategies proceed, tributary teams and state agencies will assume the following responsibilities.

- Establish process to evaluate progress and success
- Establish specific timeline to achieve pollutant load allocations by 2010
- Guide and prioritize implementation activities
- Refine Input Deck as revised data become available
- Develop outreach initiatives and strategies
- Collaborate with watershed organizations to promote and guide implementation
- Help localities, Soil and Water Conservation Districts, Planning District Commissions and businesses with local and regional watershed planning

State agencies and the tributary teams will also work closely with Planning District Commissions and Soil and Water Conservation Districts and other partners in order to:

- Encourage local governments to adopt and maintain tracking systems to account for the establishment of urban best management practices
- Promote specific strategy components to localities
- Assist in the development and implemention of local watershed plans that support the strategy
- Encourage landowners to implement specific BMPs
- Provide to local governments the technical assistance and analysis of environmental data to support program development and implementation
- Provide technical GIS capability to support local programs
- Promote, coordinate and track agricultural and urban BMPs
- Facilitate consensus among localities in each PDC jurisdiction on strategy development, refinement and implementation

An interagency steering committee operating under the direction of the Secretary of Natural Resources coordinates state oversight of the tributary strategy process. The committee will:

- Re-evaluate strategies, as necessary following the adoption of new water quality standards and based on the scheduled 2007 re-evaluation by the Chesapeake Bay Program.
- Maintain clear lines of communication in state government
- Report on implementation through an annual report
- Better engage federal agency partners

- Prioritize Chesapeake 2000 Agreement commitments that facilitate or support tributary strategy implementation
- Identify data and map support needs
- Maintain and enhance state nonpoint source assessment and targeting information
- Target available funding resources
- Promote “government-by-example” activities, such as low impact design for state projects
- Provide ongoing support for local watershed planning activities
- Refine implementation timelines
- Ensure committee composition that includes needed expertise and comprehensive agency input

The challenge is now to turn these plans into reality and to continually refine them so they implement the most effective and efficient methods to achieve our ambitious goals.

Appendices

Appendix A – Public involvement process overview

Upper James

Initial team strategy development

The Upper James Team targeted a level of effort commensurate to a calculated average of the Chesapeake Bay Program Tier 2 and Tier 3, as applied to the Chesapeake Bay Program's projection of urban land uses in 2010.

In keeping with the necessary emphasis on reductions on urban land, the initial strategy for the Upper James proposed that erosion and sediment control be applied to 100 percent of available urban land and urban nutrient management be applied to 55 percent of available urban land by the year 2010. Urban nutrient management involves the reduction of fertilizer to turf grass areas including home lawns, business, and public lands, such as parks, playing fields, school campuses, and rights of ways.

In addition, the initial strategy proposed that stormwater management practices be applied to 12 percent of all urban land by the year 2010. Stormwater management involves the installation of ponds, infiltration swales, and rain gardens (bioretention areas) to capture and temporarily store runoff from developed areas to filter out nutrients, sediment, and other pollutants. Other practices proposed for reducing nutrients and sediment from urban land include the creation of forested and grass buffers along streams, and regular septic system pumpouts. Additional opportunities for nutrient reductions exist through the connection of septic systems to wastewater treatment facilities, and the installation of septic denitrification systems.

While the strategy does place a significant new focus on urban land, continued efforts on agricultural land promises to yield substantial nutrient and sediment reductions as well. The Agricultural/Forestry Working Group utilized past implementation trends and forecasted potential future implementation as applied to local land use knowledge and the Chesapeake Bay Program's projection of agriculture and forestry land uses in 2010.

The initial strategy placed emphasis on the implementation of nutrient management plans, farm plans, conservation tillage and cover crops for both nutrient and sediment reduction. Nutrient management plan implementation provides optimum use of nutrients to maintain yield while minimizing nutrient loss. Farm plan implementation focuses on the reduction of sediment loss from highly erodible land. Conservation tillage and cover crops reduce soil and nutrient losses on cropland.

Increasing grazing land protection, stream protection and riparian buffers were also considered very important to meeting goals. These practices feature stream-buffering components that greatly reduce sediment and nutrient losses. However, the frequency of flash flooding in the watershed makes stream fencing problematic for many landowners. Animal waste management systems are already a popular practice in the watershed. Animal waste management systems provide facilities for the storage and handling of livestock and poultry waste and the control of surface runoff water. The working group did not anticipate a great increase in this practice unless the number of confined feeding operations in the watershed greatly expands.
The table below lists the meetings conducted on behalf of the Upper James River watershed tributary strategy revision process.

Date	Location
August 5th, 2003	VMI, Lexington
September 25th, 2003	Rockbridge Regional Library, Lexington
October 23rd, 2003	Virginia Horse Center, Lexington
November 20th, 2003	Rockbridge Baths Volunteer Fire Department

December 18th, 2003	Rockbridge Baths Volunteer Fire Department
February 19th, 2003	Buena Vista Municipal Building
April 13th (James basin-wide meet-ing)	VA Dept. of Forestry Building, Charlottesville

Participating stakeholders in the Upper James River strategy development efforts:
Localities:
Highland County
Bath County
City of Lexington
Augusta County
Craig County
Hot Springs Sewage Treatment Plant
Covington Sewage Treatment Plant
Alleghany County
Botetourt County
City of Buena Vista
Buena Vista Sewage Treatment Plant
Rockbridge County
Clifton Forge Sewage Treatment Plant
Lexington-Rockbridge Regional WQCF

Business and Non Profit Organizations:
Environmental System Services-Clifton Forge
Lee's Commercial Carpet/ Burlington Industries
Maury River Watershed Steering Committee
Upper James Roundtable
Canaan Valley Institute
Mead-Westvaco
Stearns & Wheeler
Cowpasture River Association
James River Association
Regional Organizations:
Bath/Highland Farm Bureau
Alleghany Farm Bureau
Rockbridge Farm Bureau
Mountain Castles Soil and Water Conservation District
Mountain Soil and Water Conservation District
Central Shenandoah Planning District Commission
Headwaters Soil and Water Conservation District
Natural Bridge Soil and Water Conservation District
Roanoke Planning District Commission
Virginia Rural Water Association

Federal and State Agencies:
Department of Environmental Quality
Virginia Department of Game and Inland Fisheries
Virginia Department of Health
Virginia Cooperative Extension
Virginia Department of Forestry
U.S. Natural Resources Conservation Service

Middle James

The Middle James River watershed tributary strategy revision process began with the kickoff meeting held on June 25, 2003 in Buckingham County. This meeting was to update current and new stakeholders in the region about the statewide and local tributary strategy revision process, and to reestablish a team of watershed stakeholders to develop and revise previous tributary strategy goal documents. State agency staff discussed Virginia's commitment to water quality, restoring water quality in the Chesapeake Bay and its tributaries, the local affects from the tributary strategies, and future activities to ensure local input on how to meet the new goals set by the multi-jurisdictional Chesapeake Bay Program.

The meeting was well attended by stakeholders from around the watershed and consisted of federal, state, and local government representatives, citizens, the Piedmont James River Roundtable, and other watershed organizations. Following the information session, the meeting served as an open forum for the approximately forty participants to voice their questions and concerns.

The formation of the Middle James River watershed tributary strategy team was based on a voluntary sign-up process. At the conclusion of the June kickoff meeting, attendees were asked to provide contact information if they were interested in participating in the revision process. The collection of names were considered the new team members, however, membership was open throughout the process.

The table below lists the meetings conducted on behalf of the Middle James River watershed tributary strategy revision process.

Date	Location
June 25, 2003	Buckingham County (Buckingham County High School)
August 22, 2003	Henrico County (DEQ – Piedmont Regional Office)
September 4, 2003	City of Charlottesville Thomas Jefferson Planning District Commission (not a regular team meeting)
October 15, 2003	Henrico County (County Administration Building)
November 14, 2003	Conference Call (Nonpoint Source Workgroup)
November 25, 2003	Conference Call (Nonpoint Source Workgroup)
November 17, 2003	Conference Call (Point Source Workgroup)
December 17, 2003	Amelia County (Hamner Public Library)
January 13, 2004	City of Richmond (Richmond Regional Planning District Commission)
April 13th (James basin-wide meeting)	VA Dept. of Forestry (Charlottesville)

Participating stakeholders in the Middle James River strategy development efforts:

Localities:

Albemarle County
Buckingham County
Chesterfield County
Hanover County
Henrico County
Nelson County
Prince Edward County
Prince George County
City of Charlottesville
City of Hopewell
City of Richmond

Regional Organizations:
Crater Planning District Commission
Hanover-Caroline Soil & Water Conservation District
Henricopolis Soil & Water Conservation District
Hopewell Regional Wastewater Treatment Facility
James River Soil & Water Conservation District
Monacan Soil & Water Conservation District
Richmond Regional Planning District Commission
Rivanna Water & Sewer Authority

South Central Wastewater Authority
Thomas Jefferson Planning District Commission
Thomas Jefferson Soil & Water Conservation District
Virginia Association of Counties
Virginia Association of Municipal Wastewater Agencies
Virginia Forestry Association
Virginia Poultry Federation

Business and Non Profit Organizations:
Friends of Chesterfield's Riverfront
Friends of Rockfish Watershed
Friends of the Appomattox
James River Association

BWX Technologies
Dominion Resources
DuPont Teijin Films
Hancock Forest Management
Honeywell - Hopewell
Greeley & Hansen
Greif, Inc.
O'Brien & Gere Engineering
Philip Morris
Resource Management Service, Inc.

Federal and State Agencies:
Chesapeake Bay Local Assistance Department
Virginia Department of Conservation & Recreation
Virginia Department of Environmental Quality
Virginia Department of Forestry
Virginia Department of Transportation

Lower James

Participating stakeholders in the Lower James River strategy development efforts:

Localities

City of Chesapeake
City of Hampton
City of Williamsburg
County of Gloucester

City of Newport News	County of Isle of Wight
City of Norfolk	County of James City
City of Poquoson	County of Surry
City of Portsmouth	County of York
City of Suffolk	Town of Franklin
City of Virginia Beach	Town of Smithfield
City of Virginia Beach- Dept of Ag	

Regional Organizations

Hampton Roads PDC	SWCD - Colonial
Middle Peninsula PDC	SWCD - Colonial
Richmond Regional PDC	SWCD - Colonial
Crater PDC	SWCD – James River
Middle Peninsula PDC	SWCD- VA Dare
Richmond Regional PDC	SPSA
Hampton Roads Sanitation District	

Business and Non Profit Organizations

Elizabeth River Project	Isle of Wight Citizens
Friends of Powhatan Creek	James River Association
Friends of Scott's Creek	Sierra Club
Chesapeake Bay Foundation	York Watershed Council
Surf Riders Foundation	Moffit & Nichols
	CH2MHill

Federal and State Agencies

U.S. EPA	Virginia CBLAD
U.S. Fish and Wildlife	Virginia DCR
U.S. Navy	Virginia DEQ
U.S. NRCS	Virginia Institute for Marine Science
	Virginia DOT – Hampton Roads District

Stakeholder participation during this revision process involved several public meetings and workgroup meetings. The revision-meeting schedule was as follows:

August 7, 2003
Kick Off Meeting
Hampton Roads Planning District Commission- Board Room
Chesapeake, VA
October 2, 2003
Tributary Team Meeting/Roundtable Meeting
Hampton Roads Planning District Commission- Board Room
Chesapeake, VA
October 31, 2003
BMP Workgroup Meetings

Hampton Roads Planning District Commission- Board Room
Chesapeake, VA
November 6, 2003
Tributary Team Meeting/Roundtable Meeting
Hampton Roads Planning District Commission- Board Room
Chesapeake, VA
November 24, 2003
BMP Workgroup Meetings
Hampton Roads Planning District Commission- Board Room
Chesapeake, VA
December 9, 2003
BMP Workgroup Meetings
Hampton Roads Planning District Commission- Board Room
Chesapeake, VA
December 18, 2003
Tributary Team Meeting/Roundtable Meeting
Newport News Public Library – Main Street
Newport News, VA
January 15, 2004
Tributary Team Meeting/Roundtable Meeting
Hampton Roads Planning District Commission- Board Room
Chesapeake, VA
February 27, 2004
Tributary Team Meeting/Roundtable Meeting
Hampton Roads Planning District Commission- Board Room
Chesapeake, VA
April 19, 2003
Public Informational Meeting
Williamsburg, VA

Tributary Strategy Team Perspectives:

Upper James

The Upper James tributary strategy team has had a generally positive attitude throughout the tributary strategy revision process. Those participants that attended meetings on a regular basis are hopeful that the James tributary strategy will lead to positive outcomes. There is, however, a great deal of concern with the cost, practicality, equity and fairness in the implementation phase of the strategy.

The tributary strategy process has been viewed as an opportunity to allow local stakeholders an opportunity to identify areas of concern and how, theoretically, to manage these areas. All members of the team know that public education will be crucial for success.

The main stakeholder issues or concerns for the Upper James include availability of funding, equity between regulated point sources and non-regulated nonpoint sources, accurate tracking of implemented best management practices by various agencies, and the accuracy of the Chesapeake Bay Watershed Model and Scenario Builder.

Middle James

The Middle James tributary strategy team was dominated by conversations of point source allocations and the equity between point and nonpoint source reduction responsibility. The group was generally resistant to participating in the actual revision process, however, there were a handful of participants that did provide insight and information regarding best management practices for forestry and agricultural lands.

The main issues discussed by the team were those of funding, equity, and responsibility for implementing the tributary strategy.

Lower James

During the strategy revision process, the Hampton Roads Planning Commission hosted a series of Lower James River Roundtable meetings where extensive local input was provided. The following considerations were proposed by the stakeholder group in an effort to sufficiently address the concerns with implementing the new strategy.

- **Flexibility of implementation:** The levels of implementation and associated Best Management Practices (BMPs) proposed in the tributary Strategy are designed to reflect what is necessary to meet the goals under current capabilities, with existing BMPs accepted in the Bay Model. These do not however, reflect the realities in 2010 or the technologies identified up to that time. In fact it is highly probable new, more efficient and cost effective BMPs will be identified before 2010. Consequently, when new BMPs or implementation strategies are identified, they will be inserted in place of the less efficient, more costly BMPs currently identified to achieve the prescribed goals.

- **Resources for Implementation:** The proposed level of implementation and associated BMPs, as well as prospective BMPs and strategies requires new resources. What is presented in the 2003 progress run represents near maximum capacity of implementation for the above implementers with existing resources. In order to reach the prescribed 2010 goals, significant financial, technical, political and personnel resources will need to be identified and provided to the implementers both in the short term and the long-term. It should also be noted that the continued maintenance of existing BMPs and assuring continuance of current progress would require a secure level of funding.

- **Trading:** While the strategy outlines levels of implementation for BMPs within specified Geographic regions, it is anticipated the nutrient trading within the sub-basins will be employed to achieve the prescribed goals and therefore the specified quantities of BMPs will likely shift as we progress towards the goal.

- **Capping**: Once the 2010 Goal has been achieved, additional strategies will be required and re-assessed to maintain the goal and continued to improve the health of the bay and it tributaries. The considerations of Growth, land use transition and maintenance of existing BMPs are all significant factors to maintaining the Goals. It is anticipated that this effort will rely heavily on trading and the implementation of new and more efficient technologies.

- **Federal Facilities**: Due to the nature of the operations on many of the federal facilities within the watershed, it is commonly not feasible to comprehensively catalog the existing Best Management Practices on site. Further, it is beyond the reasonable scope of authority of a State led initiative to propose conservation activity on said facilities. Consequently, it is recommended that the Federal government require implementation strategies on each of its facilities that are consistent with the efforts underway in the host locality.

Appendix B – Nonpoint source input decks

Nonpoint source input deck details, James River basin.

BMP Name	Loading Source	Upper James	Middle James	Lower James	James TO-TAL
Forest Buffers	Conventional-Till	1825	7792	5808	15425
Forest Buffers	Conservation-Till	0	0	0	0
Forest Buffers	Hay	12683	31827	129	44639
Forest Buffers	Pasture	29407	48657	244	78308
Forest Buffers	Mixed Open	19826	80724	2088	102638
Wetland Restoration	Conventional-Till	0	0	0	0
Wetland Restoration	Conservation-Till	0	0	0	0
Wetland Restoration	Hay	12683	5305	64	18052
Wetland Restoration	Mixed Open	19826	26908	2088	48822
Land Retirement	Conventional-Till	0	0	0	0
Land Retirement	Conservation-Till	0	0	0	0
Land Retirement	Hay	0	0	0	0
Grass Buffers	Conventional-Till	1825	11686	5808	19319
Grass Buffers	Conservation-Till	0	0	0	0
Tree Planting	Conventional-Till	0	0	0	0
Tree Planting	Conservation-Till	0	0	0	0
Tree Planting	Hay	12683	10608	129	23420
Tree Planting	Pasture	29407	8111	122	37640
Tree Planting	Mixed Open	19826	26908	2088	48822
Conservation-Tillage	Conventional-Till	8093	55508	62524	126125
Urban Forest Buffers	Pervious Urban	5295	32166	5557	43018
Tree Planting	Pervious Urban	5295	2145	1111	8551
Nutrient Management Plans	Conventional-Till	0	2278	0	2278
Nutrient Management Plans	Conservation-Till	7666	50037	62524	120227
Nutrient Management Plans	Hay	41855	156217	2433	200505
Yield Reserve	Conventional-Till	425	526	3290	4241
Yield Reserve	Conservation-Till	426	0	0	426
Yield Reserve	Hay	4650	1645	25	6320
Conservation Plans	Conventional-Till	384	2278	3123	5785
Conservation Plans	Conservation-Till	8093	50037	62524	120654
Conservation Plans	Hay	44179	156217	2433	202829
Conservation Plans	Pasture	130372	254226	4302	388900
Cover Crops (Early-Planting)	Conventional-Till	384	2278	1499	4161
Cover Crops (Early-Planting)	Conservation-Till	7666	52587	59234	119487
Off-Stream Watering w/ Fencing	Pasture	27447	80285	1359	109091
Off-Stream Watering w/o Fencing	Pasture	13723	26762	452	40937
Off-Stream Watering w/ Fencing & Ro-tational Grazing	Pasture	27447	53522	905	81874
Animal Waste Management / Barnyard Runoff Control	Manure Acre = 145 Ani-mal Units	30	102	64	196
Wet Ponds & Wetlands	Pervious Urban	3983	30634	15876	50493
Wet Ponds & Wetlands	Impervious Urban	2031	13793	12370	28194
Infiltration Practices	Pervious Urban	3983	30634	15876	50493
Infiltration Practices	Impervious Urban	2031	13793	12370	28194
Filtering Practices	Pervious Urban	3983	30634	15876	50493
Filtering Practices	Impervious Urban	2031	13793	12370	28194
Erosion & Sediment Control	Pervious Urban	3706	90064	10447	104217
Erosion & Sediment Control	Impervious Urban	2102	47922	8659	58683
Urban Nutrient Management	Pervious Urban	23476	171122	99244	293842
Mixed Open Nutrient Management	Mixed Open	69062	383438	33712	486212
Horse Pasture Management	Mixed Open	0	12990	622	13612
Forest Harvesting Practices	Forest	1424	7272	918	9614

BMP Name	Loading Source	Upper James	Middle James	Lower James	James TO-TAL
Septic Connections	Septic	0	141	0	141
Septic Denitrification	Septic	1641	11163	3576	16379
Septic Pumping	Septic	12305	83719	26820	122844

Appendix C – Comparison of TS1 and draft tributary strategy input decks

Land Use	BMP	Upper James River Basin			Middle James River Basin			Lower James River Basin		
		VA TS1	VATS2	Difference	VA TS1	VATS2	Difference	VA TS1	VATS2	Difference
Forest	Forest Harvesting Practices	0	1,424	1,424	0	9,091	9,091	2,194	1,886	-308
Hay	Forest Buffers	362	12,683	12,321	13,625	31,827	18,202	155	129	-26
	Wetland Restoration	23	12,683	12,660	689	5,305	4,616	9	64	55
	Land Retirement	2,850	0	-2,850	31,266	0	-31,266	315	0	-315
	Tree Planting	0	12,683	12,683	0	10,608	10,608	0	129	129
	Nutrient Management Plans	80,458	41,855	-38,603	157,085	156,217	-868	2,447	2,433	-14
	Yield Reserve	0	4,650	4,650	18,586	1,645	-16,941	2,277	25	-2,252
	Conservation Plans	81,319	44,179	-37,140	166,603	156,217	-10,386	2,447	2,433	-14
Pasture	Forest Buffers	1,407	29,407	28,000	11,467	48,657	37,190	0	244	244
	Tree Planting	0	29,407	29,407	6,363	8,111	1,748	188	122	-66
	Conservation Plans	619	130,372	129,753	306,544	254,226	-52,318	4,709	4,302	-407
	Off-Stream Watering w/ Fencing	4	27,447	27,443	950	80,285	79,335	13	1,359	1,346
	Off-Stream Watering w/o Fencing	4	13,723	13,719	3,788	26,762	22,974	167	452	285
	Off-Stream Watering w/ Fencing & RG	26,603	27,443	840	251,670	53,522	-198,148	2,690	905	-1,785
Low-Till	Carbon Sequestration	0	0	0	0	0	0	0	0	0
	Conservation Plans	6,566	8,093	1,527	43,406	50,037	6,631	40,260	62,524	22,264
	Cover Crops (Early-Planting)	0	0	0	0	0	0	0	0	0
	Cover Crops (Late-Planting)	6,566	7,666	1,100	37,533	52,587	15,054	30,507	59,234	28,727
	Forest Buffers	87	0	-87	4,595	0	-4,595	2,225	0	-2,225
	Grass Buffers	125	0	-125	2,208	0	-2,208	2,568	0	-2,568
	Land Retirement	0	0	0	0	0	0	0	0	0
	Nutrient Management Plans	6,567	7,666	1,099	42,606	50,037	7,431	16,276	62,524	46,248
	Tree Planting	0	0	0	90	0	-90	0	0	0
	Wetland Restoration	22	0	-22	241	0	-241	143	0	-143

Land Use	BMP	Upper James River Basin			Middle James River Basin			Lower James River Basin		
		VA TS1	VATS2	Difference	VA TS1	VATS2	Difference	VA TS1	VATS2	Difference
	Yield Reserve	0	426	426	800	0	-800	7,807	0	-7,807
High-Till	Carbon Sequestration	0	0	0	10,699	0	-10,699	9,384	0	-9,384
	Conservation Plans	0	384	384	0	2,278	2,278	12,798	3,123	-9,675
	Conservation-Tillage	6,567	8,093	1,526	43,406	55,508	12,102	40,260	62,524	22,264
	Cover Crops (Early-Planting)	0	0	0	0	0	0	0	0	0
	Cover Crops (Late-Planting)	0	361	361	0	2,278	2,278	9,698	1,499	-8,199
	Forest Buffers	0	1,825	1,825	0	7,792	7,792	707	5,808	5,101
	Grass Buffers	0	1,825	1,825	0	11,686	11,686	816	5,808	4,992
	Land Retirement	5,368	0	-5,368	16,671	0	-16,671	8,487	0	-8,487
	Nutrient Management Plans	0	0	0	0	2,278	2,278	5,173	0	-5,173
	Tree Planting	0	0	0	0	0	0	0	0	0
	Wetland Restoration	0	0	0	0	0	0	45	0	-45
	Yield Reserve	0	425	425	0	526	526	2,482	3,290	808
Impervious Urban	Wet Ponds & Wetlands	807	2,031	1,224	58,472	13,793	-44,679	41,861	12,370	-29,491
	Dry Det Ponds & Hyd Struct	807	0	-807	12,273	0	-12,273	4,298	0	-4,298
	Dry Ext Det Ponds	807	0	-807	31,159	0	-31,159	2,530	0	-2,530
	Urban Infiltration Practices	807	2,031	1,224	2,016	13,793	11,777	982	12,370	11,388
	Urban Filtering Practices	807	2,031	1,224	303	13,793	13,490	321	12,370	12,049
	Urban Stream Rest	0	0	0	0	0	0	0	0	0
	Urban Growth Reduction	0	0	0	0	0	0	0	0	0
	Erosion & Sediment Control	16,276	2,102	-14,174	33,270	47,992	14,722	1,000	8,659	7,659
	Impervious Surface Reduction	0	0	0	1,918	0	-1,918	759	0	-759
Pervious Urban	Wet Ponds & Wetlands	807	3,983	3,176	73,631	30,634	-42,997	37,342	15,876	-21,466
	Dry Det Ponds & Hyd Struct	807	0	-807	20,659	0	-20,659	3,869	0	-3,869
	Dry Ext Det Ponds	807	0	-807	77,376	0	-77,376	2,251	0	-2,251
	Urban Infiltration Practices	807	3,983	3,176	2,012	30,634	28,622	869	15,876	15,007

Land Use	BMP	Upper James River Basin			Middle James River Basin			Lower James River Basin		
		VA TS1	VATS2	Difference	VA TS1	VATS2	Difference	VA TS1	VATS2	Difference
Pervious Urban	Urban Filtering Practices	807	3,983	3,176	301	30,634	30,333	316	15,876	15,560
	Urban Stream Rest	0	0	0	0	0	0	0	0	0
	Urban Forest Buffers	480	5,296	4,816	7,609	32,166	24,557	3,251	5,557	2,306
	Urban Tree Planting	0	5,296	5,296	3,534	2,145	-1,389	0	1,111	1,111
	Urban Nutrient Management	26,434	23,476	-2,958	113,822	171,122	57,300	87,817	99,244	11,427
	Urban Growth Reduction	0	0	0	0	0	0	0	0	0
	Erosion & Sediment Control	43,994	3,706	-40,288	96,026	90,064	-5,962	1,000	10,447	9,447
	Urban Grass Buffers	1,921	0	-1,921	7,398	0	-7,398	6,082	0	-6,082
	Forest Conservation	0	0	0	0	0	0	1,053	0	-1,053
Mixed Open	Forest Buffers	2,989	19,826	16,837	17,829	80,724	62,895	0	2,088	2,088
	Wetland Restoration	0	19,826	19,826	0	26,908	26,908	0	2,088	2,088
	Tree Planting	2,989	19,826	16,837	5,992	26,908	20,916	3,191	2,088	-1,103
	Mixed Open Nutrient Management	78,497	69,062	-9,435	433,742	383,438	-50,304	38,558	33,712	-4,846
Manure Acre = 145 AUs	Animal Waste Management	30	30	0	102	102	0	64	64	0
Reduced Crop TP Applications	16 percent to 30 percent Poultry Phytase	16 percent	30 percent	14 percent	0	0	0	16 percent	30 percent	14 percent
Imp Units = lbs TN Transported	20 percent Poultry Litter Transport	0	0	0	4,263	11,177	6,914	0	0	0
Imp Units = lbs TN Transported	10 percent Livestock Manure Transport	0	0	0	79,444	83,824	4,381	0	0	0
Imp Units = lbs TP Transported	20 percent Poultry Litter Transport	0	0	0	0	0	0	0	0	0
Imp Units = lbs TP Transported	10 percent Livestock Manure Transport	0	0	0	0	0	0	0	0	0
Imp Units = systems	Septic Denitrification & Pumping	0	1,641	1,641	4,263	11,177	6,914	3,208	3,575	367
Imp Units = systems	Septic Pumping	16,407	12,305	-4,102	79,444	83,824	4,381	9,865	26,820	16,955
Imp Units = systems	Septic Connections	0	0	0	0	0	0	0	0	0

Appendix D – TS1 input decks

The Upper James strategy

The initial attempt to develop a mix of best management practices that would result in reductions to meet the allocation was carried out at the Team level. The Team strategy identifies what measures could be implemented in the Upper James watershed to meet the reduction goals, assuming that abundant resources would be made available. The Team members representing the Commonwealth developed the initial strategy for the urban source category with guidance from the Urban Working Group. The level of effort is a calculated average of the Chesapeake Bay Program Tier 2 and Tier 3, as applied to the Chesapeake Bay Program's projection of urban land uses in 2010.

In keeping with the necessary emphasis on reductions on urban land, the initial strategy for the Upper James proposed that erosion and sediment control be applied to 100 percent of available urban land and urban nutrient management be applied to 55 percent of available urban land by the year 2010. Urban nutrient management involves the reduction of fertilizer to turf grass areas including home lawns, business, and public lands, such as parks, playing fields, school campuses, and rights of ways.

In addition, the initial strategy proposed that stormwater management practices be applied to 12 percent of all urban land by the year 2010. Stormwater management involves the installation of ponds, infiltration swales, and rain gardens (bioretention areas) to capture and temporarily store runoff from developed areas to filter out nutrients, sediment, and other pollutants. Other practices proposed for reducing nutrients and sediment from urban land include the creation of forested and grass buffers along streams, and regular septic system pumpouts. Additional opportunities for nutrient reductions exist through the connection of septic systems to wastewater treatment facilities, and the installation of septic denitrification systems.

While the strategy does place a significant new focus on urban land, continued efforts on agricultural land promises to yield substantial nutrient and sediment reductions as well. The Agricultural/Forestry Working Group utilized past implementation trends and forecasted potential future implementation as applied to local land use knowledge and the Chesapeake Bay Program's projection of agriculture and forestry land uses in 2010.

The initial strategy placed emphasis on the implementation of nutrient management plans, farm plans, conservation tillage and cover crops for both nutrient and sediment reduction. Nutrient management plan implementation provides optimum use of nutrients to maintain yield while minimizing nutrient loss. Farm plan implementation focuses on the reduction of sediment loss from highly erodible land. Conservation tillage and cover crops reduce soil and nutrient losses on cropland.

Increasing grazing land protection, stream protection and riparian buffers were also considered very important to meeting goals. These practices feature stream-buffering components that greatly reduce sediment and nutrient losses. However, the frequency of flash flooding in the watershed makes stream fencing problematic for many landowners. Animal waste management systems are already a popular practice in the watershed. Animal waste management systems provide facilities for the storage and handling of livestock and poultry waste and the control of surface runoff water. The working group did not anticipate a great increase in this practice unless the number of confined feeding operations in the watershed greatly expands.

Upper James

Practice	Units	2001	2002	Draft Strategy	Tier 3
AGRICULTURAL					
Animal Management Sys./Runoff Control	systems	18	0	46	32
Alternative Uses of Manure/Manure Transport	lbs exported	0	0	0	0
Retirement of Highly Erodible Land	acres	2,514	5	8,219	14,264
Conservation Tillage	acres	10,761	0	6,567	7,624
Cover Crops	acres	7	0	6,566	6,517
Riparian Forest Buffers	acres	131	318	1,856	10,841
Riparian Grass Buffers	acres	16	3	125	413
Rotational Grazing/Grazing Land Protection	acres	14,647	4,625	26,603	106,376
Stream Protection with Fencing	acres	339	49	432	60,028
Stream Protection without Fencing	acres	0	0	4	4,943
Stream Stablization	feet	0	0	0	0
Tree Planting	acres	0	0	0	0
Wetland Restoration	acres	0	0	45	233
Farm Plans	acres	41,103	1,515	88,504	223,147
Nutrient Management Plan Implementation	acres	2,744	1,535	87,024	31,336
URBAN					
Erosion and Sediment Control	acres	0	0	60,270	0
Forest Conservation	acres	0	0	0	0
Nutrient Management	acres	0	0	26,634	35,861
Riparian Forest Buffer	acres	0	0	480	752
Riparian Grass Buffers	acres	0	0	1,921	1,731
Stormwater Management, Total	acres	0	0	8,070	
Wet Ponds and Wetlands	acres	0	0	1,614	
Dry Detention Ponds and Hydrodynamic Structures	acres	0	0	1,614	
Dry Extended Detention Ponds	acres	0	0	1,614	
Infiltration Practices	acres	0	0	1,614	
Filtering Practices	acres	0	0	1,614	
Roadway Systems	acres	0	0	0	
Impervious Surface Reduction /Nonstructural Practices	acres	0	0	0	
Street Sweeping and Catch Basin Inserts		0	0	0	
Stream Restoration	feet	0	0	0	
Tree Planting	acres	0	0	0	
MIXED OPEN					
Nutrient Management	acres	0	0	78,497	107,388

Practice	Units	2001	2002	Draft Strategy	Tier 3
Riparian Forest Buffers	acres	0	0	2,989	742
Tree Planting	acres	0	0	2,989	742
RESOURCE BMPs					
Abandoned Mine Reclamation					
Forest Harvesting Practices					
Non-Structural Tidal Shoreline Erosion Control					
Structural Tidal Shoreline Erosion Control					
SEPTICS					
Septic Connections/Hookups	connections				
Septic Denitrification	systems				
Septic Pumping	systems			24,679	
NONPOINT SOURCE BMPs NOT CURRENTLY CREDITED IN THE MODEL					
Ammonia Emission Controls in Animal Agriculture					
Carbon Sequestration				0	1,516
Coastal Floodplain Flooding					
Innovative Cropping Systems					
Manure Additives					
Oyster Reef Restoration and Shellfish Aquaculture					
Phytase Feed Additives					
Poultry Composters					
SAV Planting and Preservation					
Voluntary Air Emission Controls within Jurisdictions (Utility, Industrial, and Mobile)					
Yield Reserve				0	13,400

Middle James

	Units	2001	2002	Draft Strategy	Tier 3
AGRICULTURAL					
Animal Waste Management Sys./Runoff Control	systems	68	0	186	113
Alternative Uses of Manure/Manure Transport	lbs exported	0	0	0	0
Retirement of Highly Erodible Land	acres	6,226	0	47,937	32,764
Conservation Tillage	acres	72,269	0	54,103	46,333
Cover Crops	acres	4,013	208	42,757	41,125
Riparian Forest Buffers	acres	164	1,265	29,687	17,395
Riparian Grass Buffers	acres	82	87	2,208	2,494
Rotational Grazing/Grazing Land Protection	acres	17,875	4,146	252,034	179,584
Stream Protection with Fencing	acres	10,975	106	98,304	79,150
Stream Protection without Fencing	acres	0	0	3,788	5,062
Stream Stablization	feet	0	0	0	0
Tree Planting	acres	0	0	6,453	7,312
Wetland Restoration	acres	19	0	930	744
Farm Plans	acres	113,188	4,595	527,251	462,556
Nutrient Management Plan Implementation	acres	63,440	6,606	206,601	115,732
URBAN					
Erosion and Sediment Control	acres	0	0	129,296	0
Forest Conservation	acres	0	0	0	0
Nutrient Management	acres	218	6,067	113,823	217,180
Riparian Forest Buffer	acres	0	0	7,609	3,936
Riparian Grass Buffers	acres	0	0	7,398	9,067
Stormwater Management, Total	acres	0	0	280,119	
Wet Ponds and Wetlands	acres	0	0	132,103	
Dry Detention Ponds and Hydrodynamic Structures	acres	0	0	32,932	
Dry Extended Detention Ponds	acres	0	0	108,535	
Infiltration Practices	acres	0	0	4,028	
Filtering Practices	acres	0	0	603	
Roadway Systems	acres	0	0	0	
Impervious Surface Reduction /Nonstructural Practices	acres	0	0	1,918	
Street Sweeping and Catch Basin Inserts		0	0	0	32,767
Stream Restoration	feet	0	0	0	97,076
Tree Planting	acres	0	0	3,534	
MIXED OPEN					
Nutrient Management	acres	0	0	433,742	434,863

	Units	2001	2002	Draft Strategy	Tier 3
Riparian Forest Buffers	acres	0	0	17,829	3,886
Tree Planting	acres	0	0	5,992	3,886
RESOURCE BMPs					
Abandoned Mine Reclamation					
Forest Harvesting Practices					
Non-Structural Tidal Shoreline Erosion Control					
Structural Tidal Shoreline Erosion Control					
SEPTICS					
Septic Connections/Hookups	connections			0	0
Septic Denitrification	systems			4,263	4,263
Septic Pumping	systems			83,246	0
NONPOINT SOURCE BMPs NOT CURRENTLY CREDITED IN THE MODEL					
Ammonia Emission Controls in Animal Agriculture					
Carbon Sequestration				10,699	
Coastal Floodplain Flooding					
Innovative Cropping Systems					
Manure Additives					
Oyster Reef Restoration and Shellfish Aquaculture					
Phytase Feed Additives					
Poultry Composters					
SAV Planting and Preservation					
Voluntary Air Emission Controls within Jurisdictions (Utility, Industrial, and Mobile)					
Yield Reserve				142,567	

Lower James

	Units	2001	2002	Draft Strategy	Tier 3
AGRICULTURAL					
Animal Waste Management Sys./Runoff Control	systems	6	1	67	61
Alternative Uses of Manure/Manure Transport	lbs exported	0	0	0	0
Retirement of Highly Erodible Land	acres	160	0	8,802	8,802
Conservation Tillage	acres	23,815	6	40,260	40,259
Cover Crops	acres	2,893	3	40,205	40,205
Riparian Forest Buffers	acres	0	33	3,087	3,263
Riparian Grass Buffers	acres	0	0	3,384	3,383
Rotational Grazing/Grazing Land Protection	acres	10	122	2,690	2,386
Stream Protection with Fencing	acres	0	0	1,376	1,895
Stream Protection without Fencing	acres	0	0	167	158
Stream Stablization	feet	0	0	0	0
Tree Planting	acres	0	0	188	187
Wetland Restoration	acres	0	0	196	196
Farm Plans	acres	48,038	5,436	66,303	64,800
Nutrient Management Plan Implementation	acres	11,303	125	23,896	29,421
URBAN					
Erosion and Sediment Control	acres	0	0	2,000	0
Forest Conservation	acres	0	0	1,053	0
Nutrient Management	acres	37	5,825	87,817	110,283
Riparian Forest Buffer	acres	0	0	3,251	3,231
Riparian Grass Buffers	acres	0	0	6,082	7,443
Stormwater Management, Total	acres	0	0	142,332	
Wet Ponds and Wetlands	acres	0	0	79,203	
Dry Detention Ponds and Hydrodynamic Structures	acres	0	0	8,167	
Dry Extended Detention Ponds	acres	0	0	4,781	
Infiltration Practices	acres	0	0	1,851	
Filtering Practices	acres	0	0	637	
Roadway Systems	acres	0	0	46,934	
Impervious Surface Reduction /Nonstructural Practices	acres	0	0	759	
Street Sweeping and Catch Basin Inserts		0	0	5,500	
Stream Restoration	feet	0	0	0	
Tree Planting	acres	0	0	0	
MIXED OPEN					
Nutrient Management	acres	0	0	38,558	

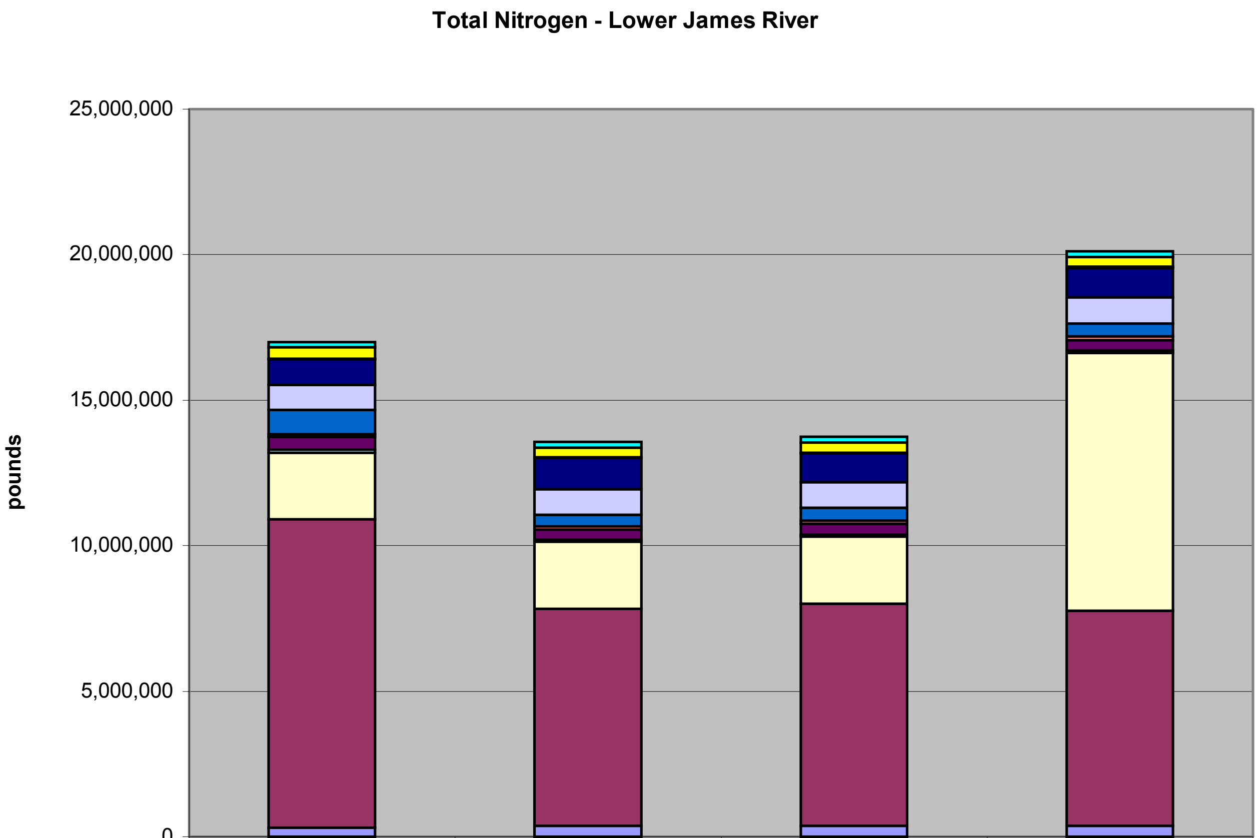
	Units	2001	2002	Draft Strategy	Tier 3
Riparian Forest Buffers	acres	0	0	0	
Tree Planting	acres	0	0	3,191	3,191
RESOURCE BMPs					
Abandoned Mine Reclamation					
Forest Harvesting Practices				2,194	
Non-Structural Tidal Shoreline Erosion Control					
Structural Tidal Shoreline Erosion Control					
SEPTICS					
Septic Connections/Hookups	connections		0		
Septic Denitrification	systems		0	3,208	3,270
Septic Pumping	systems		0	9,865	
NONPOINT SOURCE BMPs NOT CURRENTLY CREDITED IN THE MODEL					
Ammonia Emission Controls in Animal Agriculture					
Carbon Sequestration				9,384	9,384
Coastal Floodplain Flooding					
Innovative Cropping Systems					
Manure Additives					
Oyster Reef Restoration and Shellfish Aquaculture					
Phytase Feed Additives					
Poultry Composters					
SAV Planting and Preservation					
Voluntary Air Emission Controls within Jurisdictions (Utility, Industrial, and Mobile)					
Yield Reserve				12,608	12,609

Appendix E -- Lower James loadings informational charts

Understanding that more than 33 percent of the land on the Lower James River has been and will likely remain forested, and approximately 3 percent is open water, there is less than 65 percent of the land that controllable load reductions can be achieved.

The following narrative and associated charts represent loading fractions by land use category. It is important to note that the non-controllable contributing land uses are incorporated in the total figures for each year. The changes it load contributions in each category is primarily contributed to either reductions or additions to the controllable load land uses.

Nitrogen. In the base year of 1985, point sources were the largest contributor of controllable nitrogen loads in the lower James River basin accounting for 62 percent of the total nitrogen load. Urban land uses (pervious, impervious, mixed open and septic) were the second largest contributor, with 23 percent of the total load. Agricultural cropping and other agricultural land uses contributed 10 percent and two percent respectively with only three percent of the total load being "uncontrollable from atmospheric deposition and forest. In 2001, the controllable nitrogen load decreased substantially primarily from point source reduction efforts. From 1985 to 2001 Point sources reduced their controllable load of nitrogen by more than 30 percent however, they still accounted for 55 percent of the total 2001 load of nitrogen. Urban land uses continued to contribute a similar load; however, their relative contribution increased to 29 percent of the total load. The agricultural contribution saw little change. The decrease in point source loads is attributed to several factors but primarily the implementation of BNR at several plants and the redistribution of flows between 1985 and 2001. For the 2002 progress run, the model was recalibrated to reflect a more accurate land use load. This recalibration provided a more accurate distribution of loads by land use and as a result, the 2002 loads for pervious urban greatly increased. While most other land use contributions remained the same, Total urban is now the largest contributor at 52 percent, second being point sources at 37 percent and agricultural crop and other agriculture being seven percent and one percent respectively. This progression begins to reflect the relative contributions within the lower James River Basin planning area as being dominated by point source and urban/urbanizing activity (a combined 89 percent). This however does not directly correlate to the direct land uses to which BMPs can be applied. Total urban/ suburban comprises approximately 54 percent of total land area while agriculture is less than 13 percent. It should be noted that due to cost effectiveness, approximately 80 percent of the proposed nitrogen reductions will be achieved on agricultural lands.



	1985	2000	2001	2002
AtDep Water	191,229	195,496	195,496	195,496
Forest	388,742	339,189	340,630	340,412
Hay	20,537	24,106	24,393	25,409
High Till	883,917	1,071,844	992,439	1,020,900
Imp Urban	848,640	872,244	885,908	896,771
Low Till	845,911	401,050	438,174	450,921
Manure	88,658	120,688	116,010	116,230
Mixed Open	431,231	336,946	364,097	361,391
Pasture	106,934	79,252	78,443	83,068
Perv Urban	2,280,558	2,295,686	2,296,403	8,873,493
Point Source	10,600,397	7,461,080	7,630,037	7,373,370
Septic	315,573	373,608	376,441	379,272

year

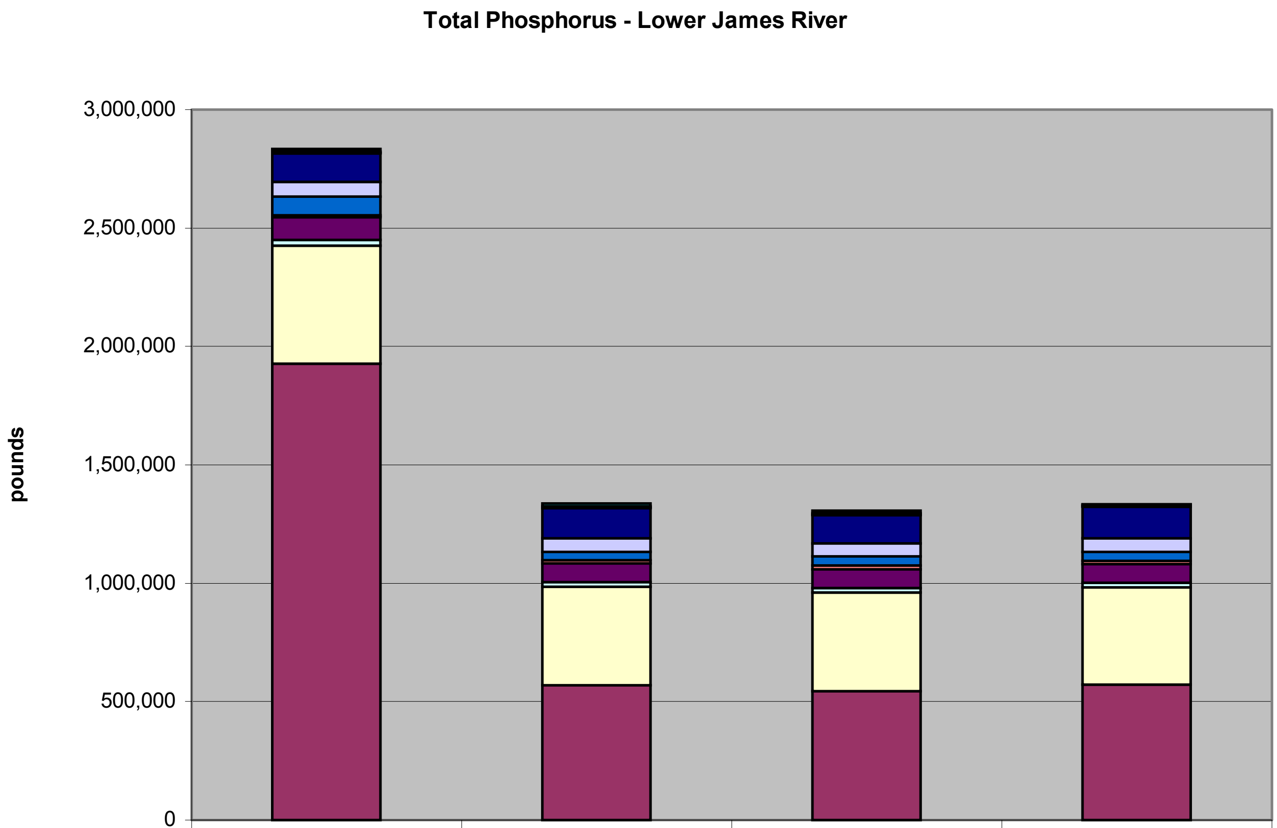
The Nitrogen loads by land use and relative reduction percentages will be more accurately reflected in the 2003 progress run. The 2003 progress run will evaluate the actual urban BMPs currently implemented on the urban/suburban land uses. This is discussed in greater detail in the following section.

Phosphorus. In the base year of 1985, Point sources were the largest contributor of controllable phosphorus loads in the lower James River basin accounting for 68 percent of the total phosphorus load. Urban land uses (pervious, impervious, mixed open and septic) were the second largest contributor, with 23 percent of the total load. Agricultural cropping and other agricultural land uses contributed seven percent and one percent respectively with only two percent of the total load being "uncontrollable" from atmospheric deposition and forest.

In 2001, the controllable phosphorus load decreased substantially primarily from point source reduction efforts. From 1985 to 2001 point sources reduced their controllable load of phosphorus by more than 28 percent however, they still accounted for 42 percent of the total 2001 load of phosphorus. Urban land uses slightly reduced their load (by about 16 percent); however, their relative contribution increased to 42 percent of the total load. The agricultural loads experienced a similar reduction percentage of 18 percent and a relative contribution increase of a combined 15 percent. The decrease in point source loads is attributed to several factors but primarily the implementation of BNR at several plants and the redistribution of flows between 1985 and 2001. The urban and agricultural reductions were also a result of BMP implementation.

As stated in the nitrogen discussion, the model was recalibrated to reflect a more accurate land use load for the 2002 progress run. This recalibration provided a more accurate distribution of loads by land use; however, unlike the nitrogen, no significant changes in load or contribution were noted.

As with the nitrogen discussion, the phosphorous load reflect the relative contributions within the lower James River Basin Planning area as being dominated by point source and urban/urbanizing activity (a combined 84 percent). This however does not directly correlate to the direct land uses to which BMPs can be applied. Total urban/ suburban comprises approximately 54 percent of total land area while agriculture is less than 13 percent. It should be noted that due to cost effectiveness, approximately 46 percent of the proposed phosphorus reductions will be achieved on agricultural lands, with the remaining 54 percent being addressed by urban/sSuburban BMPs. There are currently no additional BMPs planned for the point sources.

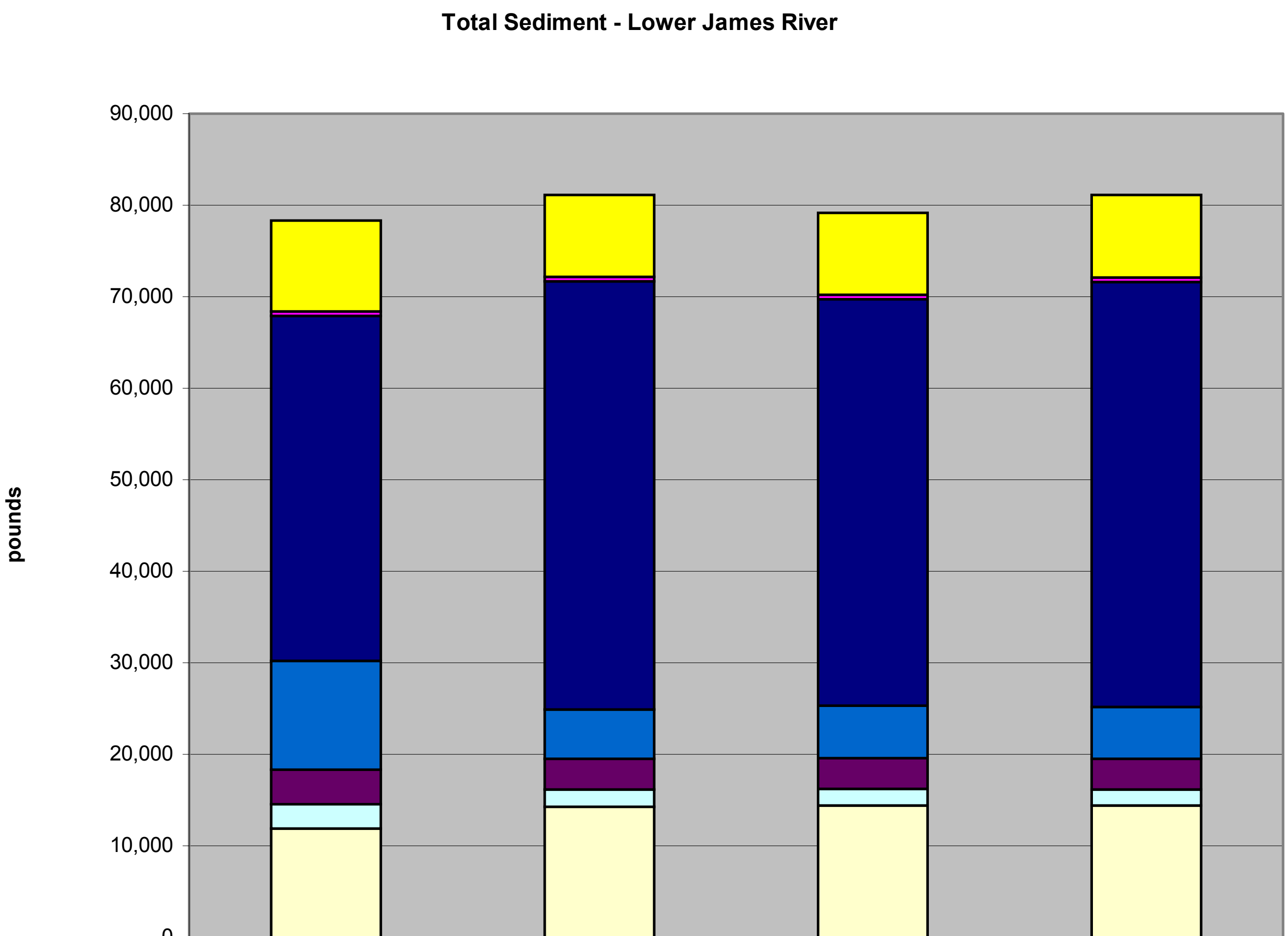


	1985	2000	2001	2002
AtDep Water	11,099	11,099	11,099	1,109
Forest	6,194	5,470	5,492	5,488
Hay	3,751	3,803	3,347	3,476
High Till	119,005	128,509	117,862	132,254
Imp Urban	63,822	55,964	56,897	57,595
Low Till	76,393	34,813	38,101	38,748
Manure	10,789	14,687	14,118	14,144
Mixed Open	93,653	79,481	78,752	78,109
Pasture	23,575	19,552	19,494	19,794
Perv Urban	498,640	415,746	416,111	410,868
Point Source	1,928,222	568,607	545,607	571,622
Septic	0	0	0	0

year

Sediment. Unlike nitrogen and phosphorous loads, sediment loads are dominated by urban/suburban and agricultural land uses. In the base year of 1985 and again in 2001, agricultural crops contributed 63 percent of the modeled total sediment load. Urban/suburban land uses accounted for about 20 percent with other agricultural land uses contributing around 4-5 percent in both years. A slight increase in load for the intervening model year (2000) simply due to a shift in agricultural practices.

The 2002 progress run revealed similar results to 2000 due primarily to changes in agricultural practices. Reductions of sediment will occur primarily on the agricultural lands with regulatory driven reductions in the urban/suburban lands.



	1985	2000	2001	2002
AtDep Water	0	0	0	0
Forest	9,932	8,973	9,004	8,998
Hay	457	476	485	490
High Till	37,719	46,794	44,410	46,418
Imp Urban	0	0	0	0
Low Till	11,850	5,360	5,718	5,671
Manure	0	0	0	0
Mixed Open	3,802	3,362	3,367	3,372
Pasture	2,689	1,858	1,817	1,744
Perv Urban	11,862	14,295	14,386	14,421
Point Source	0	0	0	0
Septic	0	0	0	0

year

As mentioned previously, the above charts represent the tracked BMPs applied to the land uses identified. During the revision process, extensive work was performed by the local stakeholders to identify current on the ground implementation of accepted BMPs. This resulted in a significant increase of implementation above what was identified in the 2002 progress numbers. In that the "ground-truthed" implementation has not been run through the watershed model, it cannot directly applied to the 1985, 2000, 2001 and 2002 progress sets provided herein. These implementation numbers will, however, be incorporated into the 2003 progress run. It is anticipated that the progress run will be complete and available in the summer of 2004. Not withstanding, the enclosed chart represents the general degree of offset from the 2002 progress run acres covered by BMPs and the 2003 "ground-truthed" numbers. Due to time constraints, this evaluation was not performed on all BMPs only the key Urban BMPs where local stakeholders where able to accurately assess the non-CBP tracked implementation. Consequently, on those BMPs where accurate numbers were collected are included in the chart. This information was extracted from locality tracking systems required either under the MS-4 permits, the CBPA or other verifiable program.

2003 Voluntary BMP implementation Comparison

URBAN	Units	2001	2002	2003 not tracked
Erosion and Sediment Control	Acres	0	0	426
Forest Conservation	Acres	0	0	3647
Riparian Forest Buffer	Acres	0	0	659
Riparian Grass Buffers	Acres	0	0	989
Stormwater Management				
Wet Ponds and Wetlands	Acres	0	0	49323
Dry Detention & Hydrodynamic Structures	Acres	0	0	4610
Dry Extended Detention Ponds	Acres	0	0	3041
Infiltration Practices	Acres	0	0	967
Filtering Practices	Acres	0	0	478
Roadway Systems	Acres	0	0	714,700
Street Sweeping and Catch Basin Inserts		0	0	21,733
Resource BMPs				
Structural tidal Shoreline Erosion	Feet	0	0	159,277

The above numbers for 2001 and 2002 reflect what was actually tracked through the CBP Tracking system. In that Virginia does not currently have a consistent mechanism to track and report urban BMPs, previous year progress runs reflected no implementation. While it is suspected that similar discrepancies exist in the agricultural arena, due to time constraints, this data was not collected. Through this revision process, it has been clearly demonstrated that a significant amount of conservation practices are being implemented beyond the cost share programs. The incentives for this are primarily regulatory in the urban arena and economic in the agricultural arena, however, when feasible, many are implementing exclusively due to a conservation ethic. These numbers, once validated and verified through QA/QC will be incorporated into the final 2003 implementation numbers for the 2003 progress.

The progress to date in the Lower James Basin has been greater than originally projected; however, more is needed to reach the goals. The momentum gained will be critical to increase both the coast-shared and volunteer implementation of these BMPs.

Appendix F – Virginia Chesapeake Bay jurisdictions population.

LOCALITY	POP1980	POP1990	POP2000	2010 PROJECTIONS*	percent-POPChg_00-10
Albemarle	55783	68040	84186	97200	15.45
Amelia	8405	8787	11400	13400	17.54
Amherst	29122	28578	31894	32900	3.15
Appomattox	11971	12298	13705	14700	7.26
Bedford	34927	45656	60371	69400	14.95
Buckingham	11751	12873	15623	17001	8.82
Campbell	45424	47572	51078	53600	4.93
Charles City	6692	6282	6926	7400	6.84
Charlottesville	39916	40341	40099	39600	-1.24
Chesterfield	141372	209274	259903	316000	21.58
Colonial Heights	16509	16064	16897	17200	1.79
Cumberland	7881	7825	9017	10100	12.01
Dinwiddie	22602	20960	24533	26300	7.20
Fluvanna	10244	12429	20047	28100	40.17
Goochland	11761	14163	16863	21400	26.90
Greene	7625	10297	15244	19500	27.91
Hanover	50398	63306	86320	106001	22.80
Henrico	180735	217881	262300	301000	14.75
Hopewell	23397	23101	22277	21700	-2.59
Louisa	17825	20325	25627	29100	13.55
Lynchburg	66743	66049	65269	65300	0.04
Nelson	12204	12778	14445	15100	4.53
New Kent	8781	10445	13462	16200	20.33
Nottoway	14666	14993	15725	15700	-0.15
Orange	18063	21421	25881	30000	15.91
Petersburg	41055	38386	33740	30400	-9.89
Powhatan	13062	15328	22377	29900	33.61
Prince Edward	16456	17320	19720	22500	14.09
Prince George	25733	27394	33124	36000	8.68
Richmond City	219214	203056	197790	191600	-3.12

U.S. CENSUS	1980	1990	2000	2010 PROJECTIONS*	percent-POPChg_00-10
TOTAL	1170317	1313222	1515843	1694302	11.77

* Virginia Employment Commission projections

Appendix G – Costs by source category for all three James sub-basins

Summary of Costs By Source Category – Upper James

Upper James Estimated BMP Cost Summary

Agricultural BMPs	Cost Units	Cost/Unit	Basin Costs
Conservation-Tillage	$/Acre	$3	$0
Forest Buffers	$/Acre	$545	$23,692,184
Wetland Restoration	$/Acre	$889	$11,275,187
Land Retirement	$/Acre	$928	$0
Grass Buffers	$/Acre	$175	$315,965
Tree Planting	$/Acre	$108	$4,545,720
Nutrient Management Plans	$/Acre	$7	$316,720
20% Poultry Litter Transport	$/Wet Ton	$12	$0
10% Livestock Manure Transport	$/Wet Ton	$12	$0
Conservation Plans	$/Acre	$7	$898,686
Cover Crops (Early-Planting)	$/Acre	$19	$0
Cover Crops (Late-Planting)	$/Acre	$19	$152,950
Off-Stream Watering w/ Fencing	$/Acre	$284	$7,684,891
Off-Stream Watering w/o Fencing	$/Acre	$152	$2,085,896
Off-Stream Watering w/ Fencing & RG	$/Acre	$186	$1,535,633
Stream Stabilization	$/Acre	$12	$0
Animal Waste Management	$/Acre	$32,278	$332,986
Yield Reserve	$/Acre	$30	$165,030
30% Poultry Phytase	N/A	$0	$0
Total Cost for Agricultural BMPs			**$53,001,848**

Point Source Reductions	Cost
Phosphorus Reductions	$1,780,246
Nitrogen Reductions	$20,281,441
Total Costs for Point Source Reductions	**$22,061,687**

Basin Total*	**$153,207,097**

*Does not include Technical Assistance

Urban BMPs	Cost Units	Cost/Unit	Basin Costs
Wet Ponds & Wetlands	$/Acre	$820	$4,931,480
Dry Det Ponds & Hyd Struct	$/Acre	$820	$0
Dry Ext Det Ponds	$/Acre	$820	$0
Urban Infiltration Practices	$/Acre	$820	$4,931,480
Urban Filtering Practices	$/Acre	$820	$4,931,480
Urban Stream Rest	$/Mile	$63,360	$0
Urban Forest Buffers	$/Acre	$108	$571,860
Urban Tree Planting	$/Acre	$108	$571,860
Urban Nutrient Management	$/Acre	$15	$352,140
Urban Growth Reduction	$/Acre	$22	$0
Erosion & Sediment Control	$/Acre	$2,500	$14,520,000
Total Cost for Urban BMPs			**$30,810,300**

Mixed Open BMPs	Cost Units	Cost/Unit	Basin Costs
Wetland Restoration	$/Acre	$889	$17,625,314
Tree Planting	$/Acre	$108	$2,141,208
Mixed Open Nutrient Management	$/Acre	$15	$1,035,930
Forest Buffers	$/Acre	$545	$10,805,170
Total Cost for Mixed Open BMPs			**$31,607,622**

Forest BMPs	Cost Units	Cost/Unit	Basin Costs
Forest Harvesting Practices	N/A	$21	$29,975
Total Costs for Forest BMPs			**$29,975**

Septic BMPs	Cost Units	Cost/Unit	Basin Costs
Septic Denitrification	$/System	$8,065	$13,234,665
Septic Pumping	$/System	$200	$2,461,000
Septic Connections	$/System	$1,500	$0
Total Cost for Septic BMPs			**$15,695,665**

Summary of Costs By Source Category – Middle James

Middle James Estimated BMP Cost Summary

Agricultural BMPs	Cost Units	Cost/Unit	Basin Costs
Conservation-Tillage	$/Acre	$3	$0
Forest Buffers	$/Acre	$545	$47,327,840
Wetland Restoration	$/Acre	$889	$4,716,145
Land Retirement	$/Acre	$928	$0
Grass Buffers	$/Acre	$175	$2,015,507
Tree Planting	$/Acre	$108	$2,021,652
Nutrient Management Plans	$/Acre	$7	$972,469
20% Poultry Litter Transport	$/Wet Ton	$12	$0
10% Livestock Manure Transport	$/Wet Ton	$12	$0
Conservation Plans	$/Acre	$7	$2,126,238
Cover Crops (Early-Planting)	$/Acre	$19	$0
Cover Crops (Late-Planting)	$/Acre	$19	$1,038,483
Off-Stream Watering w/ Fencing	$/Acre	$284	$19,654,055
Off-Stream Watering w/o Fencing	$/Acre	$152	$4,067,824
Off-Stream Watering w/ Fencing & RG	$/Acre	$186	$5,843,359
Stream Stabilization	$/Acre	$12	$0
Animal Waste Management	$/Acre	$32,278	$1,150,500
Yield Reserve	$/Acre	$30	$65,130
30% Poultry Phytase	N/A	$0	$0
Total Cost for Agricultural BMPs			**$90,999,203**

Point Source Reductions	Cost
Phosphorus Reductions	$6,171,738
Nitrogen Reductions	$246,646,919
Total Costs for Point Source Reductions	

Basin Total*	**$987,970,199**

*Does not include Technical Assistance

Urban BMPs	Cost Units	Cost/Unit	Basin Costs
Wet Ponds & Wetlands	$/Acre	$820	$36,430,140
Dry Det Ponds & Hyd Struct	$/Acre	$820	$0
Dry Ext Det Ponds	$/Acre	$820	$0
Urban Infiltration Practices	$/Acre	$820	$36,437,520
Urban Filtering Practices	$/Acre	$820	$36,430,140
Urban Stream Rest	$/Mile	$63,360	$0
Urban Forest Buffers	$/Acre	$108	$3,473,928
Urban Tree Planting	$/Acre	$108	$231,660
Urban Nutrient Management	$/Acre	$15	$2,472,555
Urban Growth Reduction	$/Acre	$22	$0
Erosion & Sediment Control	$/Acre	$2,500	$344,965,000
Total Cost for Urban BMPs			**$460,440,943**

Mixed Open BMPs	Cost Units	Cost/Unit	Basin Costs
Wetland Restoration	$/Acre	$889	$23,921,212
Tree Planting	$/Acre	$108	$2,906,064
Mixed Open Nutrient Management	$/Acre	$15	$5,751,570
Forest Buffers	$/Acre	$545	$43,994,580
Total Cost for Mixed Open BMPs			**$76,573,426**

Forest BMPs	Cost Units		Basin Costs
Forest Harvesting Practices	N/A	$21	$153,076
Total Costs for Forest BMPs			**$153,076**

Septic BMPs		Cost/Unit	Basin Costs
Septic Denitrification	$/System	$8,065	$90,029,595
Septic Pumping	$/System	$200	$16,743,800
Septic Connections	$/System	$1,500	$211,500
Total Cost for Septic BMPs			**$106,984,895**

Summary of Costs By Source Category – Lower James

Lower James Estimated BMP Cost Summary

Agricultural BMPs	Cost Units		Basin Costs
Conservation-Tillage	$/Acre	$3	$116,834
Forest Buffers	$/Acre	$545	$3,350,115
Wetland Restoration	$/Acre	$889	$56,896
Land Retirement	$/Acre	$928	$0
Grass Buffers	$/Acre	$175	$1,016,400
Tree Planting	$/Acre	$108	$27,108
Nutrient Management Plans	$/Acre	$7	$375,245
20% Poultry Litter Transport	$/Wet Ton	$12	$0
10% Livestock Manure Transport	$/Wet Ton	$12	$0
Conservation Plans	$/Acre	$7	$122,185
Cover Crops (Early-Planting)	$/Acre	$19	$0

Urban BMPs	Cost Units	Cost/Unit	Basin Costs
Wet Ponds & Wetlands	$/Acre	$820	$23,161,720
Dry Det Ponds & Hyd Struct	$/Acre	$820	$0
Dry Ext Det Ponds	$/Acre	$820	$0
Urban Infiltration Practices	$/Acre	$820	$23,161,720
Urban Filtering Practices	$/Acre	$820	$23,161,720
Urban Stream Rest	$/Mile	$63,360	$0
Urban Forest Buffers	$/Acre	$108	$600,156
Urban Tree Planting	$/Acre	$108	$119,988
Urban Nutrient Management	$/Acre	$15	$1,400,730
Urban Growth Reduction	$/Acre	$22	$0
Erosion & Sediment Control	$/Acre	$2,500	$47,765,000

Cover Crops (Late-Planting)	$/Acre	$19	$1,141,482
Off-Stream Watering w/ Fencing	$/Acre	$284	$385,956
Off-Stream Watering w/o Fencing	$/Acre	$152	$68,704
Off-Stream Watering w/ Fencing & RG	$/Acre	$186	$143,778
Stream Stabilization	$/Acre	$12	$0
Animal Waste Management	$/Acre	$32,278	$1,825,590
Yield Reserve	$/Acre	$30	$99,450
30% Poultry Phytase	N/A	$0	$0
Total Cost for Agricultural BMPs			

Point Source Reductions	**Cost**
Phosphorus Reductions	$112,778
Nitrogen Reductions	$171,400,000
Total Costs for Point Source Reductions	**$171,512,778**

Basin Total*	**$337,562,694**

*Does not include Technical Assistance

Total Cost for Urban BMPs	**$119,371,034**

Mixed Open BMPs	**Cost Units**	**Cost/Unit**	**Basin Costs**
Wetland Restoration	$/Acre	$889	$1,856,232
Tree Planting	$/Acre	$108	$225,504
Mixed Open Nutrient Management	$/Acre	$15	$505,680
Forest Buffers	$/Acre	$545	$1,137,960
Total Cost for Mixed Open BMPs			**$3,725,376**

Forest BMPs		**Cost/Unit**	**Basin Costs**
Forest Harvesting Practices	N/A	$21	$19,324
Total Costs for Forest BMPs			**$19,324**

Septic BMPs	**Cost Units**	**Cost/Unit**	**Basin Costs**
Septic Denitrification	$/System	$8,065	$28,840,440
Septic Pumping	$/System	$200	$5,364,000
Septic Connections	$/System	$1,500	$0
Total Cost for Septic BMPs			

Appendix H – Virginia Partnership: Organizations involved in tributary strategies and other water quality initiatives

Virginia partnership

Chesapeake Bay 2000 Agreement commitments require an unprecedented level of communication, consultation and coordination among federal, state and local governments as well as community and watershed organizations. These interactions relative to the 2000 agreement are well established between state and federal agencies.

Effective and sustainable connections with local governments and other organizations within a regional perspective are, however, still emerging. In addition to the state and federal partnerships, many effective state agency relationships exist with individual local governments relative to specific agency programs. Further, the Virginia Association of Counties and the Virginia Municipal League provide contacts among localities statewide. All of these relationships, while effective for their initial purpose, do not address the need for more extensive and effective watershed level communication and coordination.

The existing regional connections, in place Bay-wide, that support Bay agreement related local involvement include planning district commissions, watershed conservation roundtables, soil and water conservation districts. These regional entities, depending on location and level of involvement, perform various communication and coordination activities, some collectively and others individually.

Bay-wide coordination

Virginia Secretary of Natural Resources – The Office of the Secretary oversees state agencies within its purview to make sure resources and programs are well coordinated. This is done through direct interaction of agency heads across the full spectrum of natural resource issues.

Virginia Watershed Planning and Permitting Task Force – The task force consists of directors, or their designees, from the Department of Environmental Quality (DEQ), Department of Conservation and Recreation (DCR), Department of Forestry (DOF), Department of Mines Minerals and Energy (DMME), Chesapeake Bay Local Assistance Department (CBLAD), and the commissioner, or his designee, of Department of Agriculture and Consumer Services (DACS). "The task force shall undertake such measures and activities it deems necessary and appropriate to see that the functions of the agencies represented therein, and to the extent practicable of other agencies of the Commonwealth, and the efforts of state and local agencies and authorities in watershed planning and watershed permitting are coordinated and promoted." (§ 10.1-1194)

Nonpoint Source Advisory Committee (NPSAC) – This committee was formed in the 1980s to bring about a coordinated statewide approach to nonpoint source pollution control programs. It is chaired by DCR, Virginia's lead nonpoint source agency. A variety of state and federal agencies serve on the committee, all of which have significant nonpoint source water quality responsibilities.

Members include staff from DEQ, Virginia Marine Resource Commission (VMRC), Department of Game and Inland Fisheries (DGIF), DOF, DACS, CBLAD, Virginia Department of Transportation (VDOT), Virginia Cooperative Extension Service (VCES),
U.S.D.A. Natural Resources Conservation Service and the U.S. Geological Survey. The committee guides implementation of the Virginia's Nonpoint Source Management Program, a strategy required under the Clean Water Act to ensure that states give a high priority to the water quality problems resulting from runoff and other diffuse sources.

Because of NPSAC's meetings and grant review activities, state and federal agency members pursue partnerships with other groups and organizations working to prevent nonpoint source pollution.

Virginia Chesapeake Bay Interagency Workgroup – This workgroup consists of technical and managerial staff from the critical state agencies that help implement the ***Chesapeake 2000*** agreement. It is further supported by intra-agency workgroups established by the agencies as needed.

Virginia Association of Counties (VACo) and Virginia Municipal League (VML) – VACo and VML are associations of Virginia cities, towns and counties. The groups foster a wide range of communication and coordination among the localities. Both engage in local government representation, advocacy and education. The Chesapeake Bay Program is an area of common interest to these groups, hence they are engaged in the process described above.

Regional coordination

Planning District Commissions (PDCs) – These are legally constituted under the Regional Cooperation Act as political subdivisions and formally established by the local governments in defined areas. Twenty-one PDCs have been established and have been in operation for 30 years or more. Approximately 14 PDCs are wholly within the Chesapeake Bay watershed. These regional entities are formed and operate within political boundaries. PDCs function to inform and receive collective input from local governments and transfer information. Specifically, PDCs' statutory duties are to:

- Conduct studies on issues and problems of regional significance.
- Identify and study potential opportunities for state and local cost saving…through coordinated government efforts.
- Identify mechanisms for the coordination of state and local interests.
- Serve as liaison between localities and state agencies.
- Conduct strategic planning for its region.
- Develop regional functional area plans.
- Help state agencies, on request, write local and regional plans.

All of these duties support and are consistent with finding ways to realistically address the major dependence of the ***Chesapeake 2000*** agreement on local governments for successful, long-term implementation of the that agreement.

Watershed Conservation Roundtables – Established under the Water Quality Improvement Act, Nonpoint Source Cooperative Programs have been underway since early 1999. These voluntary groups, or roundtables, consist of stakeholders, local governments, community and watershed organizations, and other community interests that discuss and address watershed stewardship issues. The primary role of roundtables at this point is to provide advice to state agencies and to increase coordination among the active stakeholders on watershed based initiatives. Roundtables, while authorized under the WQIA, are not legally constituted and consequently are not afforded distinct functions beyond an advisory role.

Local Government Activities Supporting Implementation of the Agreement – Local governments obviously play a key role in the Chesapeake 2000 Bay Agreement, as they do for most other significant environmental enhancement efforts. Legislators and other interests generally are aware of the range of activities carried out by local governments. The following is a list of routine activities that contribute directly to implementation of the Bay agreement.

- Meeting applicable provisions of the Chesapeake Bay Preservation Act
- Meeting provisions of the state Erosion and Sediment Control Act

- Meeting DEQ permit requirements, such as complying with sewage treatment plant effluent limitations and other regulated discharges
- Complying with Safe Drinking Water Act provisions
- Meeting provisions of the Virginia wetlands programs
- Carrying out floodplain management
- Adopting and implementing stormwater management measures
- Conducting activities through the local Soil and Water Conservation Districts